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MAGAZINE

APRIL 16, 1991

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 10 NUMBER 7

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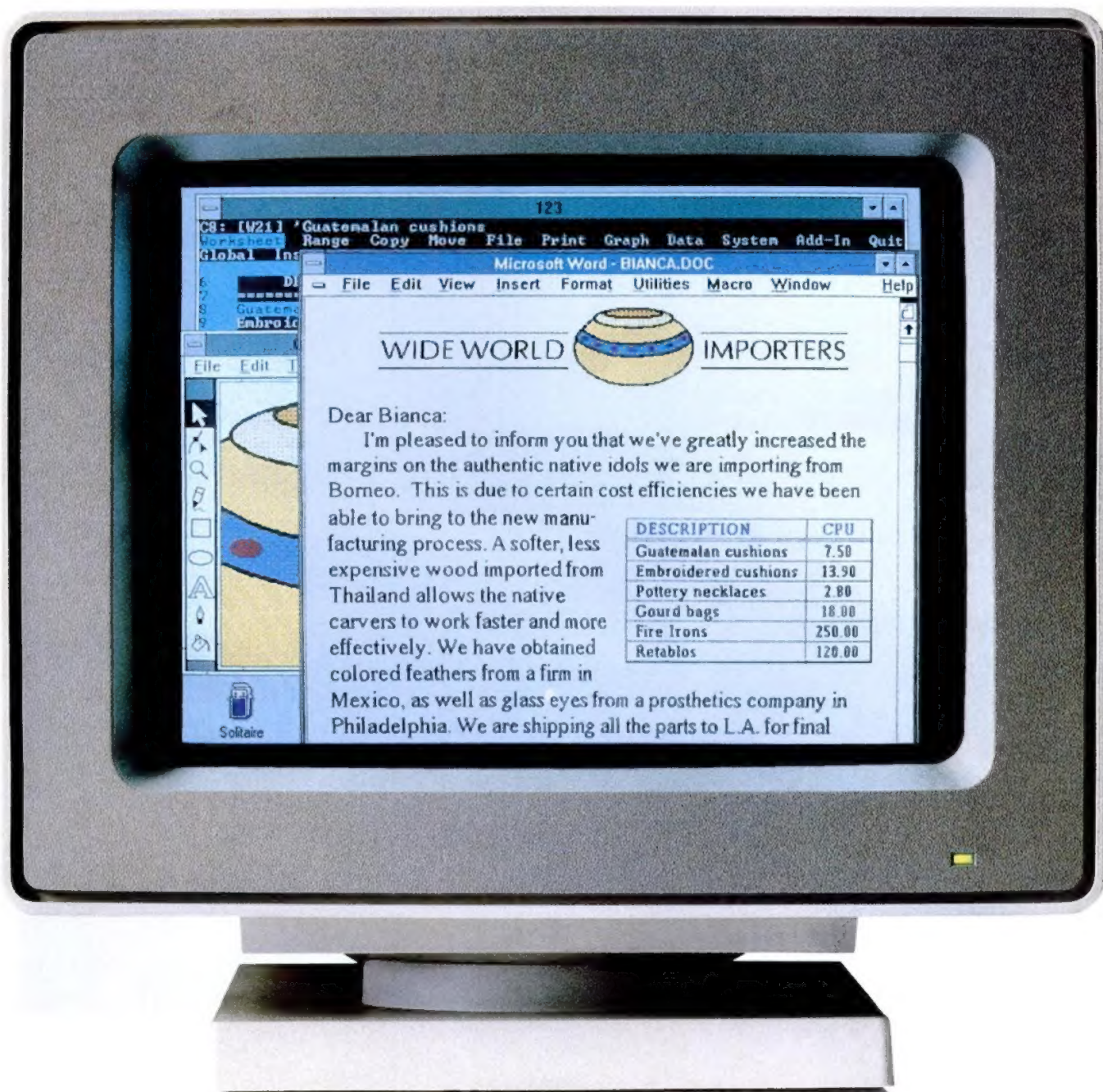
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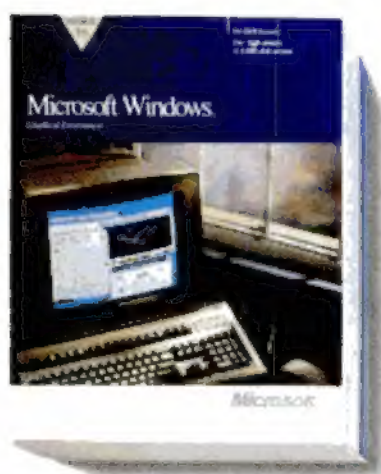
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The perfect end the lazy and p



Environment for power-hungry.



The Microsoft® Windows™ graphical environment version 3.0 makes it easy for you to do a lot more with your PC. That's because the Windows environment has friendly icons, menus and dialog boxes that make its powerful features very accessible.

Windows lets you work with a variety of applications on-screen at the same time. Including your character-based programs.

But it's when you start using Windows applications that you get the most out of your PC. Windows applications are easy. In addition they all work essentially the same way. So once you learn how to use one, you generally know how to use them all.

And they're so intuitive that experimenting with them is fun.

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So call us at (800) 541-1261, Department P30, to find out more about Windows, Windows applications or the big Windows World Conference and Exposition coming up May 20th-23rd in Atlanta.

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CIRCLE 291 ON READER SERVICE CARD

Inside



Chris Barr is one of the magazine's scouts, looking for news of products in development.

If Federal Express didn't exist, would the PC industry simply have to invent it?

Probably.

There hasn't been a technology or industry with fewer roots in one place than the personal computer business.

E-mail, bulletin boards, and on-line services have helped to make this rootlessness possible, but heavy airline travel and overnight deliveries have also played their parts.

Each issue of *PC Magazine* includes reports that were e-mailed to our New York headquarters from John Dvorak in California, Jim Seymour in Texas, and Will Zachmann in Massachusetts.

And behind the scenes, information is gathered from many corners of the country.

Chris Barr, for example, reports on West Coast developments from a base in our Foster City, California, office.

Chris is no stranger to the far-flung PC community. He helped build the magazine's on-line service from its original six-line BBS in 1986 to its current status as a full-scale on-line



service with thousands of access numbers and 150,000 subscribers.

Along with other West Coast correspondents—like Neil Rubenking in San Francisco and Barry Simon in Los Angeles—Chris talks with developers and tours their labs to get the earliest word on new products.

One of Chris's recent reports charted the progress of the *Windows* version of *WordPerfect*, a product that's expected to be out in several months.

When the review appears in *First Looks*, you won't see Chris's name because one of our *WordPerfect* specialists will do the testing. But Chris's early report gave us the ability to adapt our tests so that, when the product is ready, we'll be able to act fast.

In this issue, you'll find several stories that have taken months of planning and testing, including an endurance report on graphics hardware, and a roundup of type managers that can enhance *Windows 3.0*.

Some stories absolutely, positively cannot be done overnight.

—Gus Venditto

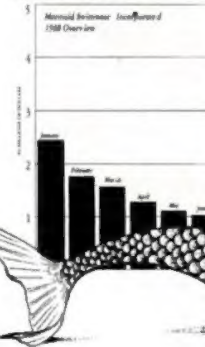
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Sales flounder early

To our shareholders:
Net income for
Mermaid Swimwear
Incorporated in 1988
increased 4% from 1987.

Highlights of Operations
The premier performer was a new line of MerMax and MerKid swimwear designed by Karina Zapata, a world-renowned designer of women's sportswear. The market in the Northeast territory was the MerMax swimwear line, proposed by my wife. The line was only moderately successful, and the line was pulled from stores two weeks after its introduction. The company realized a substantial boost to profits from Group's Undersea Adventures, a subsidiary company specializing in cruise/cuba diving vacations. The firm's president and head cruise director, Rick Group, reported interest in this leisure activity is at an all-time high. He also noted that the business was not negatively affected when one of the firm's cruise ships, captained by a former crew member of an oil

tanker, ran aground and caused a huge frigate dolphin spill along the southern tip of Cuba. Setting New Courses
In June of 1988 we acquired



Sales flounder early but surge in 2nd half

To our shareholders:
Net income for
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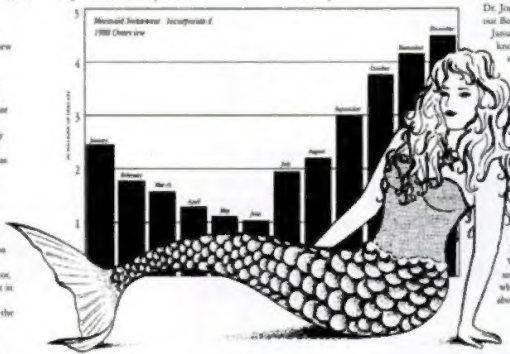
tanker, ran aground and caused a huge frigate dolphin spill along the southern tip of Cuba. Setting New Courses
In June of 1988 we acquired

Bubbly's Best Camps. No other franchise of its kind exists, making it the leading company in the ever-growing recreational fishing industry.

Another significant move in 1988 was the acquisition of the largest surfboard company in Kansas, Wright's Wave Wonders.

Addition to the board
Dr. Joan Smith was elected to our Board of Directors, effective January 1. Ms. Smith is well-known for her therapeutic swimming exercise videos. She's also a special consultant to the Russian Olympic women's swim team.

Outlook
Our 1987 performance again demonstrated that our strength lies in the field, innovative marketing of our existing products, and diversification and acquisition of ancillary industries and other get-rich-quick schemes that promises exciting possibilities for immediate profits. With sound operations in place, and a diversified platform from which to grow, we see optimism about the future.



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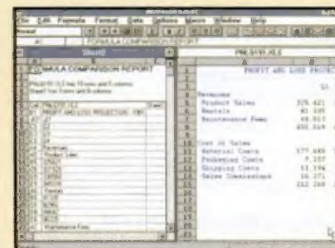
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Except where noted: All *PC Magazine* reviews are of currently available products. Comparative reviews are arranged alphabetically by product name for software, by company name for hardware. Software is free from copy protection. On benchmark test charts, shorter bars indicate faster products (less time to complete a task). Benchmark and performance tests are run on Compaq 386/25s.



**What's the
difference
between
an Austin
and a Dell?**



Editors
Choice
386/SX16
1990



Editors
Choice
286/12.5
1989



Editors
Choice
386/SX20
U.K. 1991



386/SX-16

40 Mb Hard Drive
2Mb RAM
Monitor Included
1 Floppy Drive
Microsoft Package
GE On-Site Service

\$1490

Upgrade to VGA Color
System shown \$1890.



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GE Computer Service

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"Austin Computer Systems has a winning combination... How can you lose?"

PC Magazine 286/12.5 Editor's Choice Award, 1/31/89 Issue

"Austin Computer Systems is on a roll..."

Fredric Burke, PC Magazine Computer Consultant, 9/25/90 Issue

"Austin's 386/25 WinStation is a system loaded with value..."

PC Magazine Editor's Choice Review, 1/29/91 Issue

"Do yourself a favor and check out the Austin 386/SX."

Computer Shopper, April 1990 Issue

"I have found the phone support to be excellent... I recommend them to everyone and would not hesitate to buy another." Douglas Figgs, New York Engineer, PC Magazine Service and Reliability Review, 9/25/90



QUALITY ASSURANCE

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Microprocessor: 80286 running at 16MHz.

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Video: TTL monochrome monitor with

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Keyboard: Enhanced 101 keyboard with

tactile/click touch.

Compatibility: DOS and OS/2.

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AUSTIN 386/SX16 WINSTATION

STANDARD CONFIGURATION

Microprocessor: Intel 80386SX running

at 16MHz.

Special Features: Pre-loaded with

Microsoft Windows 3.0 and MS-DOS 4.01.

Microsoft mouse. GE on-site service.

Storage: 40Mb IDE hard drive. 1.44Mb or

1.2Mb floppy disk drive.

Memory: 2Mb RAM

Expansion: 7 expansion slots (6 16-bit

and 1 8-bit).

I/O Ports: 1 parallel and 2 serial ports.

Video: 14" VGA color monitor with 16-bit

VGA color video adapter.

Keyboard: Enhanced 101 keyboard with

tactile/click touch.

Compatibility: DOS, OS/2 and Unix.

\$1990

AUSTIN 386/SX20 WINSTATION

STANDARD CONFIGURATION

Microprocessor: Intel 80386SX running

at 20MHz.

Special Features: Pre-loaded with

Microsoft Windows 3.0 and MS-DOS 4.01.

Microsoft mouse. GE on-site service.

Storage: 40Mb IDE hard drive. 1.44Mb or

1.2Mb floppy disk drive.

Memory: 2Mb RAM

Expansion: 7 expansion slots (6 16-bit

and 1 8-bit).

I/O Ports: 1 parallel and 2 serial ports.

Video: 14" VGA color monitor. 16-bit VGA

color video adapter.

Keyboard: Enhanced 101 keyboard with

tactile/click touch.

Compatibility: DOS, OS/2 and Unix.

\$2590

AUSTIN 386/25 WINSTATION

STANDARD CONFIGURATION

Microprocessor: Intel 80386 running

at 25MHz.

Special Features: Pre-loaded with

Microsoft Windows 3.0 and MS-DOS 4.01.

Microsoft mouse. GE on-site service.

Small footprint chassis.

Storage: 90Mb IDE hard drive. 1.44Mb or

1.2Mb floppy disk drive.

Memory: 2Mb RAM

Expansion: 7 expansion slots (6 16-bit

and 1 8-bit).

I/O Ports: 1 parallel and 2 serial ports.

Video: 14" VGA color monitor. 16-bit VGA

color video adapter.

Keyboard: Enhanced 101 keyboard with

tactile/click touch.

Compatibility: DOS, OS/2 and Unix.

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125MB IDE	\$1440	\$1595	\$1780	
200MB IDE	\$1820	\$1945	\$2180	
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AUSTIN 386/SX16 WINSTATION				
2MB RAM AND 1 FLOPPY DRIVE				
STARTING AT \$1890 OR \$45 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	TTL MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
40MB IDE	\$1480	\$1880	\$2035	
90MB IDE	\$1755	\$2085	\$2215	
125MB IDE	\$1885	\$2225	\$2345	
200MB IDE	\$2265	\$2505	\$2725	
OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.				

AUSTIN 386/SX20 WINSTATION				
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STARTING AT \$1990 OR \$36 PER MO.				
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CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
40MB IDE	\$1845	\$1990	\$2180	
90MB IDE	\$2025	\$2240	\$2360	
125MB IDE	\$2155	\$2370	\$2480	
200MB IDE	\$2535	\$2750	\$2970	
OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.				

AUSTIN 386/25 WINSTATION				
2MB RAM AND 1 FLOPPY DRIVE				
STARTING AT \$2220 OR \$67 PER MO.				
CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
40MB IDE	\$2220	\$2435	\$2555	
90MB IDE	\$2400	\$2680	\$2735	
125MB IDE	\$2530	\$2745	\$2865	
200MB IDE	\$2910	\$3125	\$3245	
OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.				

Difference!



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AUSTIN 386/33 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80386 running at 33MHz.
Special Features: 128K system cache. Pre-loaded with Microsoft Windows 3.0 and MS-DOS 4.01. Microsoft mouse. GE on-site service. Small footprint chassis.
Storage: 125Mb IDE hard drive with 32K cache. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 4Mb RAM
Expansion: 7 expansion slots (6 16-bit and 1 8-bit).
I/O Ports: 1 parallel and 2 serial ports.
Video: 14" VGA color monitor. 16-bit VGA color video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: DOS, OS/2 and Unix.



\$3990

AUSTIN 486/25 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80486 running at 25MHz.
Special Features: Internal 8K cache floating point unit. Pre-loaded with Microsoft Windows 3.0 and MS-DOS 4.01. Microsoft mouse. GE on-site service.
Storage: 125Mb IDE hard drive with 32K cache. 1.44Mb or 1.2Mb floppy disk drive.
Memory: 4Mb RAM (expands to 64Mb on system board).
Expansion: 8 ISA expansion slots.
I/O Ports: 1 parallel and 2 serial ports.
Video: 14" VGA color monitor. 16-bit VGA color video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: Novell, DOS, OS/2 and Unix.



\$7990

AUSTIN 486/33 WINSTATION STANDARD CONFIGURATION

Microprocessor: Intel 80486 running at 33MHz.
Special Features: EISA bus architecture. Internal 8K cache and floating point unit. Optional 64K or 256K external cache. Landmark v1.14 rating-167.8 MHz. Power meter rated @ 14.93 MIPS. Shadow RAM. EMS LIMM 4.0 support. Microsoft package. GE on-site service. Vertical chassis.
Storage: 1.2Gb SCSI hard drive. 1.44 Mb or 1.2Mb floppy disk drive.
Memory: 8Mb RAM (expands to 64Mb on system board).
Expansion: 8 32-bit EISA/ISA compatible slots. 8 slots available for bus masters.
I/O Ports: 2 parallel and 2 serial ports.
Video: 14" VGA monochrome monitor. 16-bit VGA video adapter.
Keyboard: Enhanced 101 keyboard with tactile/click touch.
Compatibility: Novell, DOS, OS/2 and Unix.



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AUSTIN 386/SX16 NOTEBOOK STANDARD CONFIGURATION

Microprocessor: 80386SX running at 16MHz.
Special Features: Weight under 8 lbs. with battery. Notepad size. Dual removable battery packs for up to 4 hour battery life. Visual/Audio low battery warning indicator. Leather carrying case. Battery and recharger included.
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Memory: 1Mb RAM (expands to 8Mb on system board).
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Video: Brilliant 10" VGA display with 640 x 480 resolution and 32-gray scale.
Keyboard: Full size embedded numeric pad with 12 function keys.
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OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

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CHOOSE MONITOR BELOW				
CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
125MB IDE	\$3880	\$4095	\$4215	
200MB IDE	\$4290	\$4505	\$4625	
330MB SCSI	\$4730	\$4945	\$5065	
1.2GB SCSI	\$6180	\$6395	\$6515	

OTHER OPTIONS ARE AVAILABLE. CALL FOR DETAILS.

AUSTIN 486/33 WINSTATION 8MB RAM AND 1 FLOPPY DRIVE STARTING AT \$5880 OR \$177 PER MG.				
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CHOOSE HARD DRIVE BELOW	VGA MONO CHROME	VGA COLOR	1024 X 768 VGA COLOR	
330MB SCSI	\$6790	\$6945	\$7065	
1.2GB SCSI	\$7700	\$7855	\$7975	

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Letters

THE FUTURE OF GEOWORKS

Unfortunately, you are probably right that *GeoWorks Ensemble* might be destined to become a historical curiosity ("The Best of 1990," January 15, 1991).

I don't think that the solution is the IBM PS/1; a better idea is bundling *GeoWorks* with another package (something like the *GeoWorks* version of *Lotus 1-2-3*). You had mentioned in *Pipeline* that Lotus is exploring the new platform. It would be a good idea for Lotus to sell that package. Imagine having the graphics power of *Microsoft Windows 3.0* and *Microsoft Excel* in an 8088 or a 286!

I hope that your prediction about *GeoWorks's* future does *not* come true and that *GeoWorks Ensemble* becomes serious competition for *Windows 3.0*.

Melvin Medina
New York, New York

MIXED FEELINGS FOR THE PS/1

Okay, what's *PC Magazine's* real opinion of the IBM PS/1? Just look at the number and variety of opinions I got from your January 15, 1991, issue:

(1) Bill Machrone's editorial: "[The PS/1] came in one box. My five-year-old put it together. . . . PCs can't be too small or too powerful. And they're not mutually exclusive anymore."

(2) William Zachmann's editorial: "The PS/1 follows the PCjr into obscurity. . . . The PS/1 repeats the basic mistakes of the PCjr, minus the funny keyboard."

(3) "The Best of 1990" cover story: "While there are clearly better values, the PS/1 delivers enough performance, value, and ease of use to avoid any danger of suffering the same fate as the PCjr."

(4) After Hours column: "Whether a given shopper should buy a PS/1 depends on how little machine he is prepared to live with, and how important he deems the IBM label."

So what is it, gang? Thumbs up or thumbs down?

Chris Niggeler
San Jose, California



Everyone has his own opinion on what should've been "The Best of 1990."



Obviously we have mixed impressions about the PS/1. While we tend to agree on what's necessary for business computing, the editors at *PC Magazine* share no single opinion on the many variations of the "home computing" theme.—Ed.

BEST OF 1990?

I do not understand how you could include *Microsoft Windows 3.0* as a finalist in the Technical Excellence category (January 15, 1990). Perhaps you meant Marketing Hype Excellence.

Where is the technical excellence in a system based on an obsolete real-mode operating system? Did any of the reviewers note that *Windows* must switch to real mode for every DOS call, has no overlapped I/O, offers lousy interapplication protection, and is a nightmare for programmers? Have any of the reviewers ever written a serious *Windows* program?

How about an article on the shortcomings of *Windows 3.0* before too many MIS managers bet their companies on it?

Wayne Johnson
Becker, Minnesota

DVORAK OR BUST

John C. Dvorak is to be commended on his January 15, 1991, article, "CD-ROM: Still a Bust."

The fact is, no search-and-retrieval software standards exist for CD-ROM. But Mr. Dvorak's comments about CD-ROM may be extrapolated to include the software industry. Replace "CD-ROM" with "software application" and his article still rings true.

Of course, a medium that keeps the publishing cost of 1,200 books to just \$2 is going to have its growing pains, and a lack of software standards is one price of CD-ROM's puberty. Fortunately, similar problems have been avoided on the hardware side through wide acceptance of ISO-9660.

All things considered, 1991 may very well be "the year of CD-ROM."

Larry Shiller
Parsippany, New Jersey

I mostly agree with Mr. Dvorak, but his January 15, 1991, rail against Intel in "Inside Track" was enough to make me write to you.

Okay, I know I'm just a "dumb Canuck" in a plaid shirt, sitting on a snowbank up here, but could someone explain to me why everyone is so pissed off at Intel? They are just doing what America is all about! They are greedily trying to maintain a monopoly on a key (major money-making) component of the computer world. Isn't that what America is for?

Intel is in the business of making money. I'm sure its charter doesn't list the corporation as a nonprofit charity organization. It may not be great for anyone else, but it sure is best for Intel if it keeps all the money for itself.

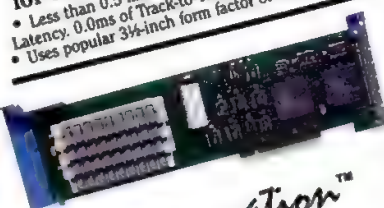
Of course, we all agree that the world might be a better place if Intel shared its 386/486/x86 design with AMD and if Lotus quit bitching and let Quattro use slash menus. We might all gain from the lower prices and proliferation of software with a common interface. But if no one got to

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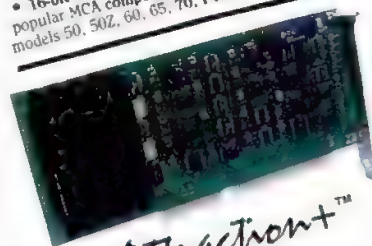
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Letters

hang onto what they developed (and get fat and happy due to their greed), then who is going to bother creating the next breakthrough?

Don Penner
Winnipeg, Manitoba, Canada

LOTUS IS TAKING OVER THE WORLD?!

Gus Venditto is blind to what's really happening when he says "The ramifications aren't major" concerning Lotus's acquisition of Samna (Pipeline, January 15, 1991).

Lotus's acquisition of Samna is earth-shaking news to anyone who has been paying attention to Lotus's recent activities. I think Lotus will soon announce the availability of a supercharged *Microsoft Windows*-compatible, integrated software package. If it doesn't make the mistake other developers have made and overprice the package, Lotus may rule the PC software world.

Vincent Chesno
Coraopolis, Pennsylvania

THE POWER OF PREDICTION

William Zachmann's prediction that IBM is going to suffer a dreadful 1991 ("1991 Predictions," January 15, 1991) made me ponder an awesome power that I possess. I have only to sell IBM short on the stock market and overnight it will go bonkers in an upward direction.

Trevelyan Beard
Markham, Ontario, Canada

BUYING BY MAIL

Your response to Jean Kreiling (Letters, December 25, 1990) about Micro Express cited the vendor's response but failed to address the legal issues.

According to federal law, a mail-order vendor may not charge against a credit card for a purchase until a shipment has been made, although a partial shipment may be enough to satisfy the requirement. Furthermore, regardless of the form of payment, a mail-order vendor is required to offer a refund if unable to fill the order within the period promised or the period specified by law.

In a situation like this, a letter to your bank refusing to pay the charge, with an explanation of the reason and supporting details, will do wonders. Be sure to include a list of all relevant telephone calls and

names. By law the bank cannot charge you interest, and if your claim is valid, they will put pressure on the vendor. You can also complain to the FTC and USPS.

Seymour J. Metz
Annandale, Virginia

DIAL 900-PORN?

I needed to call a company to get some technical help and called the number listed in my manual. The company told

I tried to explain.

"I'm not a
pervert! I'm
calling about a
computer problem."

me I must call a 900 number. I was at work and 900 numbers are blocked, but I don't give up that easily. I went to the cafeteria, dialed the 900 number on the pay phone, punched in my credit card number and was greeted with "Your call can not be completed as dialed. Stay on the line if you need operator assistance."

Well, guess what? I was told I can't charge a call to a 900 number. "Why?" I asked the operator. "Well, you know the kind of calls made to 900 numbers." I tried to explain. "I'm not a pervert! I'm calling about a computer problem."

Now I'm back to using the older version of the software.

Robert M. Allen
West Springfield, Massachusetts

THE QUALITY OF COMPUTER BOOKS

This is a good one for a tirade by Dvorak—the topic is very serious though: the quality of computer books. You wind up buying a ton of books, and the vast majority are just a minor rewrite of the manuals. It is embarrassing. I see so many books that consist of: 25 percent on how to turn the computer on, 25 percent on what DOS is, 25 percent on a rehash of the manual, and 25 percent about simplistic programming concepts addressed to a moron that has not had any exposure to any programming at all.

There are exceptions, but the majority of books are hopelessly bad. Ultimately

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PC Computing, December 1990



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Letters

publishers will pay for this because people are becoming so skeptical about the quality of these books, and aren't buying them.

Rogier F. van Vlissingen
South Norwalk, Connecticut

How many people don't
buy a computer
because it would
ruin their decor?

WHERE'S THE COLOR?

Beige, beige, beige! I don't know about you, but I am utterly sick of beige. Monitor cases, computer cases, keyboards are all beige! Macs, IBMs, clones, it doesn't matter what you get, it's going to be beige. What's so sacred about the damned color, anyway!?

Think about it for a minute. A computer is basically a piece of furniture. Now, what other piece of furniture do you spend two or three thousand dollars on and have absolutely no choice of color? How many people don't buy a computer because it would ruin their decor? I wonder. Seriously, I think the computer manufacturers are missing a bet in not providing some color choices. After all, one can find similarly equipped systems, at about the same price, from any number of clone companies. Offering some color choices would help make a company's machine unique from the competition's, and perhaps sway the customer into buying their machine rather than the other guy's.

I'd be willing to pay a bit extra for a color of my choice, and I'd say a lot of other people would, too. So, wake up computer makers! Here's a chance to make a buck!

Paul N. Weissler

Colorado Springs, Colorado

MICE ARE JUST FINE FOR ME

After reading the comments about the Appoint Mouse Pen, I felt you should hear from someone who has owned one for nine months. At first, I thought the idea was great. It took up little space on my desk, it wouldn't get lost under all my

papers, and so on. After a couple months my opinion started to change.

It takes almost twice as many steps to move the cursor, click something, and then type in something as it does with a mouse. The main problem is that you must pick up the mouse pen every time you use it. When I got *Windows*, my opinion changed dramatically. On a mouse, when you press a button, it is pressed against the desk. With the mouse pen, you must put a finger on the back side of the pen. My finger invariably ends up on a corner, so after 10 minutes of use my finger is beginning to get sore.

It may work well for laptops where it isn't used much, but it shouldn't be used as a main mouse.

Frank Powell
Arroyo Grande, California

CORRECTIONS & AMPLIFICATIONS

The correct price of Lotus Development Corp.'s *Lotus Works* ("Low-Cost Options for Easy Word Processing," December 11, 1990) is \$149.

The correct phone number for Richmond Technologies & Software Inc. ("Total Recall: Contact Management Software," December 25, 1990) is 604-299-2121.

Due to a production error, the screen displays included in our evaluation of *dBASE IV 1.1* ("dBase IV 1.1: A New Beginning," January 29, 1991) were incomplete and incorrectly colored. *dBase IV*'s default colors are blue and white. The third and fourth displays were not *dBase IV* screens.

In our New and Improved column, January 29, 1991, page 60, we should have stated that Samsung Information Systems America is a Korean subsidiary. The corresponding photo should show a 386SX/16 logo.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments, complaints, insights, and suggestions. Please send them to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access information). All letters become the property of *PC Magazine* and are subject to editing for considerations of space and clarity.

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Never



Peter Norton

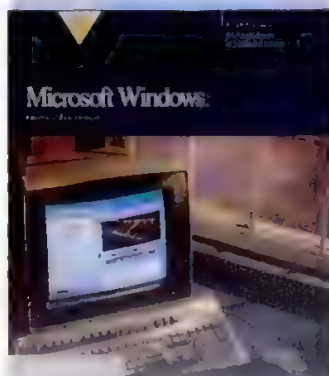
When it comes to your crucial data, Peter Norton just won't take **C>FILE NOT FOUND** for an answer. With programs like the Mace Utilities* and PC Tools*, data recovery is often mission impossible. But with the Norton Utilities* 5.0, data recovery is mission *critical*—and it can recover what no other utility can.

Data Recovery is serious business, which requires serious features. And the Norton Utilities has them all.

Norton Does Windows.

The Norton Utilities is *the* safe DOS utility program for use with windowing environments like Windows* 3.0 and DesqView.

Because PC Tools and Mace Utilities are blind to multi-tasking, they can irreversibly damage your files. While the Norton Utilities 5.0 offers three full levels of safety checks under Windows 3.0.



With a clear vision of the PC's future, the Norton Utilities 5.0 provides safe Windows 3.0 recovery.

Norton On Networks.

The Norton Utilities is the *only* utility program that provides file recovery on Novell and DOS-compatible networks. So you can use *File Save* along with *UnErase** to recover deleted files,* or *File Fix*™ to reconstruct Lotus* 1-2-3* and dBASE* files. From any node on the network.

What's more, MIS will appreciate the Norton Utilities' compliance with existing network security restrictions.

System Information provides detailed reports on network information and TSR memory allocation, as well as graphical benchmarks of disk, CPU, network, and general computer performance.

The next best thing to being there is being on the network. And the Norton Utilities 5.0 is the only data recovery tool that is.



DATA RECOVERY FEATURES	NORTON UTILITIES	PC TOOLS	MACE 1990
Number of DOS Error Messages With On-Line Advice	75	0	0
Different Types Of Data Loss Problems Solved			
File System Corruption	31	12	15
Physical Hard Disk Damage	6	0	0
Internal Data File Damage (i.e. dBASE, Lotus)	10	0	6
Disk Reliability Testing (Number Of Patterns)	80	0	0
System Information (Topics Reported)	94	15	16
NETWORK file recovery *File Save must have been installed prior to data loss.	YES*	NO	NO
WINDOWS Safe Operation	YES	NO	NO
Failsafe Design	YES	NO	NO
Effective File Encryption That Does Not Require You To Change The Way You Work	YES	NO	NO

Say Die.

Rated #1
Hard Disk Utility
InfoWorld 12/10/90

Norton's Superior Recovery Technology.

The Norton Utilities handles the toughest data recovery situations easily—predicaments other utilities handle poorly, if at all.

Advise explains cryptic DOS error messages in plain English so you can understand the problem, and gives specific recommendations on how to fix it. So your valuable data is not at the mercy of risky trial-and-error procedures.

Unlike the competition, Norton recovery procedures are easy to use and completely failsafe. And because you can UNDO changes, you won't make a bad situation worse. In fact, while using the Norton Utilities your data will even survive a sudden power loss. All in all, it's the safest, most extensive diagnostic and recovery utility available.

And only the Norton Utilities gives you every-

Norton Utilities 5.0 Adds Features, Improves Interface

"Norton's disk utilities now surpass anything you can find in PC Tools Deluxe or The Mace Utilities, and offer safeguards you can't find anywhere else."
—PC Magazine 10/16/90

Don't just take our word for it, the proof is in the press.

thing you need for optimal system performance.

The new Norton

Cache and the improved *Speed Disk*™ make your hard drive faster and more efficient. And *Calibrate*™, which outperforms SpinRite™, adjusts the interleave, identifies bad sectors, and even repairs demagnetized

areas of your drive.

So get serious about data recovery. See your dealer for the new Norton Utilities 5.0. To upgrade now call **1-800-343-4714** or fill out the coupon below. For more information, call **1-800-343-4714 Ext. 708** (in Canada, 1-800-465-2266). And in the immortal words of Peter Norton, "Never say die."

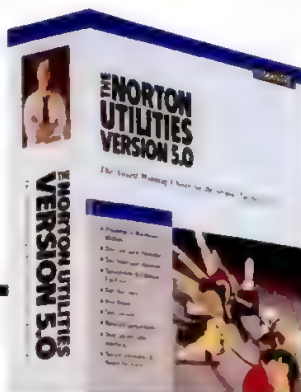
SYMANTEC.

\$59

Upgrade Now and Save \$120!

Mace Utilities and PC Tools users can now get the Norton Utilities 5.0—list price **\$179**—for **\$59**. Just send this coupon to Symantec, along with the title page from your Mace Utilities or PC Tools product manual. Send a check or have us bill your VISA or MasterCard \$59 plus tax and \$5 shipping and handling.

Norton Utilities 5.0 offer expires April 30, 1991. Valid in U.S. and Canada only. Please allow 4-6 weeks for delivery. Only one upgrade per coupon. For multiple upgrades or P.O.s, call 1-800-441-7234. For Canadian orders, call 1-800-465-2266.



Customer name _____
Company name _____
Address _____
(no PO boxes)
City/State/Zip _____
☐ Check enclosed ☐ VISA ☐ MasterCard
All payments must be made in US dollars drawn on a US bank.
Name as it appears on your card (please print) _____
Acct. No. _____
Exp. Date ____/____/____ Day phone (____) _____

Quantity	Disk Size	Unit Cost
One	☐ 5 1/4-inch ☐ 3 1/2-inch	\$59.00
In these states, add sales tax including applicable local tax: CO 3%; GA, IA, MI, NY 4%; MO 4.225%; IN, MD, MA, OH, WI 5%; DC, FL, MN, PA, CA 6%; IL, TX 6.25%; WA 6.5%; NJ 7%; CT 8%.		
Add shipping and handling:		\$ 5.00
Total:		\$ 64.00

Send to: Symantec Corporation
Attn: "Never Say Die" Offer • P.O. Box 161690
Cupertino, CA 95016-1690

4/16/91

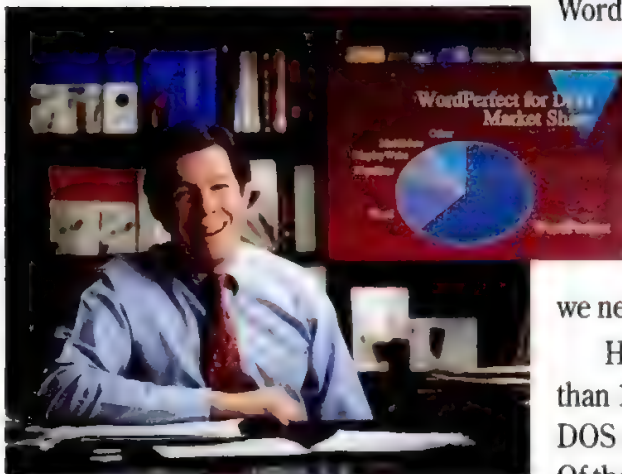
CIRCLE 184 ON READER SERVICE CARD

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WordPerfect® for Windows promises to be a sure thing, but sales projections are anyone's guess.

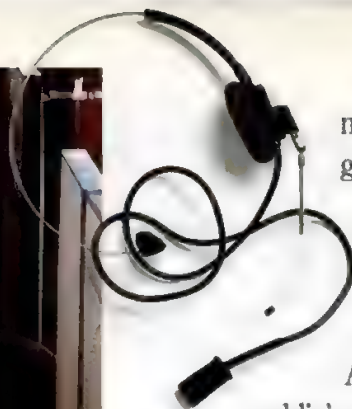


In a short time, WordPerfect® for Windows will debut on dealer shelves throughout the English-speaking world. This new word processor combines the powerful features of our world-famous WordPerfect for DOS with the ease-of-use of a graphical interface.



While we're confident WordPerfect for Windows will live up to our standards as the industry leader, we are much less confident about our sales projections. Our Vice President of Product Marketing, Clive Winn, is having trouble predicting how many copies we need to produce for our first month's orders.

Here are some questions he must consider. Of the more than 150,000 people who purchase a copy of WordPerfect for DOS each month, how many will prefer a Windows product? Of the more than six million WordPerfect for DOS users worldwide, how many will take advantage of our \$125 trade-up to WordPerfect for Windows in the first month? Of the 40,000 people who purchase a Windows word processor each month, how many will prefer WordPerfect for Windows instead of the products they are now buying? And of the two million or so Windows owners who have not purchased a word processor, how many are waiting for WordPerfect?



The more we look at all the variables, the more we think we need your help. So we're going to do what we do best; listen to what you, our current and potential customers, have to say. We'd like you to call us at **(800) 526-5069** between the hours of 9:00 a.m. and 5:00 p.m. MST on or before April 30, and make a projection of the public's demand for WordPerfect for Windows during its first month on the market.

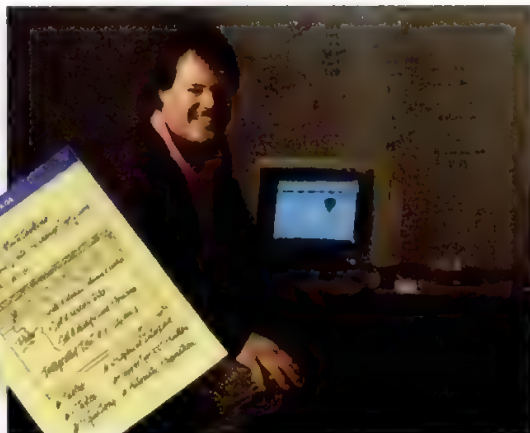
Historically, we have received orders from eager customers before the product officially is available for purchase. Therefore, you will need to include these advance orders of WordPerfect for Windows as part of your estimate of the total number of orders placed during the first 30 days after the product officially becomes available. We will use your estimate to help us project an appropriate number of units to meet our first month's demand.

Give us your best guess and we'll make it worth your while. We will reward the person whose estimate comes closest to the actual number of copies ordered during the specified time period with \$25,000. So, get out your calculator, some paper and pencils, and possibly your algebra book, and call us with your estimate.

We are anxious to bring you WordPerfect for Windows. We think it will live up to your highest expectations.

Official Rules:

1. Each entrant must provide his/her name, address, and daytime phone number. One estimate per person. Anyone submitting more than one estimate will be disqualified.
2. Contest estimates will only be received between March 18, 1991 and April 30, 1991, and they must be called in using the 800 number provided. Entrants must call in their estimates before 5:00 pm MST, April 30, 1991 to be eligible for the award.
3. Entrants must be at least 18 years of age and residents of either the U.S. or Canada. Residents of the Province of Quebec, Canada are not eligible. Offer void where prohibited by law.
4. No purchase necessary to enter. The odds of winning will depend upon the number of entries received.
5. There will be only one winner—that person whose estimate comes closest to the actual number of units ordered from WordPerfect Corporation through its distribution channel and direct from its customers within the 30 day period as described above. In case of a tie, the person with the earliest estimate will be declared the winner.
6. The prize consists of \$25,000 and one first-class, round-trip ticket to Salt Lake City, Utah. The trip will include one night's stay, food and lodging at an area hotel (tax and tip included), as well as ground transportation for a total estimated value of \$27,000. The winner will be responsible for all federal and local taxes. The winner must travel to WordPerfect Headquarters in Utah to be presented with the prize check. The prize, including the trip, is not transferable.
7. WordPerfect Corporation employees, families, affiliates, related companies, distributors and dealers, all suppliers and all persons connected with this contest are ineligible.
8. The winner will be determined by the accounting firm of Price Waterhouse and the winner will be notified by telephone on or before October 31, 1991 by 5:00 pm MST. In the event that the winner is unreachable by phone, he/she will be notified by mail.
9. Winner grants WordPerfect Corporation permission to use his/her name and/or photograph for advertising and/or promotional purposes without additional compensation.
10. To obtain a winner list, or to find out the actual number of units ordered, send a stamped, self-addressed envelope to WordPerfect Corporation, Attn: D. Clive Winn, Winner List, 1555 N. Technology Way, Orem, Utah 84057.
11. The statistical information provided above is WordPerfect Corporation's interpretation of research from International Data Corporation.
12. Winner may be required to sign an affidavit of eligibility and/or a liability release.
13. Canadian residents only: If the entrant who comes closest to the actual number of units ordered is a Canadian resident, he/she will be required to correctly answer a skill testing question of a mathematical nature. This entrant will be given at least 24 hours notice as to when the question will be posed.



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► Introducing the NEC UltraLite™ 286F notebook computer. The best value in notebooks.

Buy a typical notebook computer and you get exactly what you pay for.

A typical notebook computer.

Buy the UltraLite 286F notebook, however, and you get considerably more than you pay for.

► Atypical screen

The UltraLite 286F screen, for instance. Instead of the usual blue LCD, you get a black and white LCD double scan CGA screen. So there's greater contrast for optimized text readability. In fact, text fonts appear as clear as they do on a VGA LCD screen.

► Atypical battery life

You can use the UltraLite 286F for virtually an entire coast to coast flight, thanks to a battery life that's twice as long as most other notebooks'.

► Atypical proportions

Speaking of getting around, the UltraLite 286F is actually small and light enough to fit comfortably in your briefcase.

► Atypical for anyone but NEC

You also get standard features like an internal 3.5" floppy disk drive in addition to a 20MB hard disk drive. An 80C286 processor running at 12MHz with 1MB of RAM expandable to 5MB. Not to mention connectivity options including serial, parallel, CRT and external disk drive ports.

In short, it's totally unheard of for anyone else to give you so much in such an affordable computer.

But for NEC? It's very typical.

For product literature or location of your nearest dealer call 1-800-NEC-INFO.



CIRCLE 217 ON READER SERVICE CARD

by
Gus Venditto

Advisor

SECOND-GUESSING THE BANK'S CALCULATION OF MORTGAGE PAYMENTS

I am prepaying my mortgage and am looking for a program that will let me keep track of the bank.

Given a principle and interest rate, the program must be able to handle prepayments of various amounts at odd times, such as \$100 a month this month, nothing next month, then \$300 and so on.

I want to know interest, principle, and when the loan will be paid off. A program like *Managing Your Money* doesn't provide the flexibility to do this.

Michael Romano
Missouri City, Texas



With current revelations about the errors that many banks make in figuring adjustable rate mortgages, I'm sure a lot of people are thinking about monitoring the way their bank is calculating mortgage payments.

A spreadsheet has all the tools needed for making your own calculations on loan payments; in *Lotus 1-2-3* you'd use the PMT (payment) function; in *Microsoft Excel* you have an even easier job with the IPMT (interest payment) function. Of course, if you do it yourself, there's no way of knowing that you've constructed the correct template unless you can show it to an expert.

That's where programs like *Managing Your Money* and *Dollars and Sense* can be useful since accountants have certified the accuracy of the underlying math in their mortgage functions.

Your need is more complex since you intend to change some of the assumptions that the bank made when it granted the loan.

Electrosonics of Fraser, Mich., (800-858-8448) sells *Mini-Amort*, a \$79.95 program designed for people who want to create their own loan strategy. It uses an easy pull-down menu interface to provide all the tools needed to play what-if games with mortgages, including variable mort-

■ **SECOND-GUESSING THE BANK'S CALCULATION OF MORTGAGE PAYMENTS:** Programs that help you devise a repayment strategy.

■ **CLOSING THE ESCAPE ROUTES FROM WITHIN A BASIC PROGRAM:** Techniques needed in a security program.

■ **BAD MATCHES BETWEEN SCSI ADAPTERS AND DEVICES:** The sad truth about SCSI.

■ **STARTING A CAREER IN SHAREWARE:** Helpful advice for marketing software.

gages. With this program you can calculate the effect of irregular payments and a recurring extra payment.

CLOSING THE ESCAPE ROUTES FROM WITHIN A BASIC PROGRAM

I'm working on a password protection program for my system that comes on automatically during boot-up. It's written in GW-BASIC 3.22 and works fine but there's one more thing I'd like to do.

Is there a way that I can disable Ctrl-Break for aborting the program and Ctrl-Alt-Del for rebooting?

B. Duersch
Hamilton, Ohio



Neither I nor the magazine's BASIC brain trust know of any way to disable Ctrl-Break or Ctrl-Alt-Del from within GW-BASIC.

If you upgrade to Microsoft QuickBASIC, though, you can turn off Ctrl-Break as a simple menu choice.

And, when you compile the program in QuickBASIC—which is a must for a security program—you can also use the option of turning off Ctrl-Break when the program executes.

Blocking Ctrl-Alt-Del takes a bit more work. This kind of chore is better handled with assembly language code.

You can buy that kind of code in a toolkit. Crescent Software (W. Redding, Conn.; 203-438-5300) includes such a routine in its *QuickPak Professional* library. It costs \$169 and includes 470 routines—most of them written in assembler—that can be run by your BASIC program.

Whether or not you choose to buy Crescent's BASIC library, you really should upgrade to QuickBASIC. It costs only about \$60 or \$70 at discount, and includes enhancements to the BASIC language that will become increasingly common.

It's expected that all releases of DOS in the foreseeable future will include enhancements to DOS's batch facility that use the same syntax and structure found in QuickBASIC, so it's likely that your investment would pay off for a long time. Plus, if you find BASIC useful, you'll benefit immensely by having a compiler; even with continued improvements to the BASIC language within DOS, it's unlikely that DOS will ever include a BASIC compiler.

BAD MATCHES BETWEEN SCSI ADAPTERS AND DEVICES

I recently acquired a SCSI adapter when buying a CD-ROM player. After realizing what this SCSI interface really is, I got excited about the theoretical versatility and bought a SCSI hard disk. That's when the problems started. I was not able to find any help to get the SCSI hard disk to work with the adapter that came with the CD-ROM adapter. What kind of software is

Advisor

there for installing a SCSI-interfaced device?

Viktor Weisshaupt
Oulu, Finland



Unfortunately, you got caught by a loose implementation of the SCSI standard that has reduced the bright promise of interchangeable storage controlled by a single card to a jungle of incompatible devices.

I don't know of any software that will be able to mate your hard disk with the CD-ROM's host adapter. The problem is that out of the 64 commands defined by ANSI for communication between a SCSI device and its host, only 4 were required to conform to a specific syntax; the rest of the commands have been defined by individual vendors in their own way and, as a result, it's rare to find compatibility between the adapters and hosts sold by separate vendors. (Complete details were provided in the October 17, 1990, issue in the introduction to the story, "SCSI: An

Interface Whose Time Has Come.")

There's hope that SCSI's promise will be realized at some point in the future, since a second ANSI standard, SCSI II, establishes enough mandatory commands to ensure that all SCSI devices will work in concert—those that conform to SCSI II, that is.

STARTING A CAREER IN SHAREWARE

I have written a mathematics program for students who can't afford the power of a symbolic math package. I'd like to sell it as shareware but I'm not sure about how to go about it.

Uchenna Ogbuji
East Brunswick, New Jersey



Shareware is one of the most vibrant systems for entrepreneurs you'll find anywhere. But to be a part of it, the first thing you'll have to do is go on-line.

PC MagNet maintains a list of user groups in its database (option 3 from the main menu). Through a user group, you can find a wide range of public bulletin boards who'll be interested in posting

your software for their members to explore. That's how most of today's successful shareware authors got started.

Thanks to the cooperative spirit shared by dozens of established shareware programmers, you can get a lot of advice and help in charting these waters. The Association of Shareware Professionals is an informal trade group comprised of programmers who are willing to help other authors in order to help shareware programs maintain a reputation for integrity.

You can find out more information by joining their forum on CompuServe (type GO SHARE at any CompuServe prompt). To join, send \$50 to the Executive Director, Association of Shareware Professionals, P.O. Box 5786, Bellevue, WA 98006; the association will require that you agree to their bylaws, which are posted in the CompuServe forum.

ASK THE ADVISOR

Send your questions to Advisor, PC Magazine, One Park Avenue, New York, NY 10016 or upload them to PC MagNet (see the instructions for joining on page 8 of this issue). Sorry, but personal replies are not possible. ■

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CIRCLE 231 ON READER SERVICE CARD

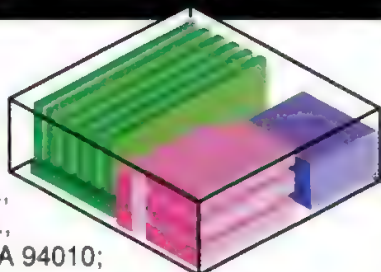
A Winner.

We didn't say it.
PC Magazine did.



FACT FILE

EDITORS' CHOICE



Tangent

386SX/20

Tangent
Computer, Inc.,
303 Beach Rd.,
Burlingame, CA 94010;
(800)223-6677,
(415) 342-9388.

List Price: With 1MB RAM, 1.2MB 5.25-inch or 1.44MB 3.5-inch floppy disk drive, one parallel and two serial ports, VGA monitor, \$1,644; with 2MB RAM, 60MB hard disk, DOS 4.01, \$2,278; with 105MB hard disk, \$2,384.

In Short: An excellent contender with above-average electronics and hard-working peripherals, the Tangent 386SX/20 adds an FCC Class B certification to the pile to make it an extremely attractive computer for either home or office.

"The 20 MHz 80386SX is the new entry-level business system of choice, starting right now."

PC Magazine

Best choice of the best choices.

Here's how PC Magazine summed up the Tangent 386™SX/20 (Tangent's Model 320s):

"The Tangent 386SX packs outstanding video, expandability to 8 MB, and plenty of free slots into a nicely reduced-size case. The price is right too. This PC offers a 105 MB hard disk and Orchid's ProDesigner II Super VGA card for a mere \$2295. Add in clear documentation and on-site service (with Tangent's one-year warranty) and you have a solid winner."

"The Tangent 386SX/20 is the best of the show; it garnered top scores in all of our video tests."

A system with a future. The Tangent 386SX/20 runs all of yesterday's programs. All of today's. And most important, tomorrow's. Because it implements the full Intel 80386 feature set.



Standard Configuration:

- Intel 20 MHz 80386SX CPU **\$2295**
- 2 MB of Memory (to 8 MB)
- 105MB 17ms Quantum Hard Disk
- Orchid ProDesigner II SuperVGA Card
- 14" SuperVGA Color Monitor
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High performance. Low price. Tangent offers you a complete line of high performance systems: 20 MHz 80386, 25 and 33 MHz 80386SD, and award winning 25 and 33 MHz 80486. All, at what some people think is the best price-to-performance ratio in the business.

Built your way. Dealing with Tangent is like owning your own computer factory. Tell us exactly how you want your system configured, we'll build it, test it, and ship it. Your way. And even though it's your configuration, it carries our one-year warranty.

PC Magazine's windup: "Add an FCC Class B rating and a one-year warranty on parts and labor that includes on-site service into the bargain, and you begin to suspect that the Tangent 386SX/20 is a winner. Consider the price/performance ratio of the computer and that suspicion starts to look like a certainty." Bill O'Brien, PC Magazine, 11/27/90

Thanks Bill. We couldn't have said it better.

Order now, Toll Free:
1-800-223-6677



TANGENT
COMPUTER

197 Airport Blvd. Burlingame, CA 94010
Phone: 415/342-9388 FAX: 415/342-9380

CIRCLE 391 ON READER SERVICE CARD

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PC
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EDITORS'
CHOICE

November 27, 1990
Tangent 320S

ZEOS® 386SX

Now, You Can Move Up to the

386SX

ZEOS-386SX-16



**"WITH
SO MUCH
GOING
FOR IT HOW
COULD
YOU GO
WRONG?"**

-PC MAGAZINE

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SUPPORT. THE AMAZ-
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ZEOS 386SX. EDITOR'S CHOICE.

**"WITH SO MUCH GOING FOR IT
HOW COULD YOU GO WRONG?"
-PC MAGAZINE**

You simply can't go wrong! That's the conclusion PC Magazine came to after comparing the ZEOS '386SX to 31 other machines. Editor's Choice!

"ZEOS comes in a winner... The fastest SX tested... packing plenty of value... great expandability, quality parts and down to earth pricing... how could you go wrong?"
Editor's Choice.

Your ZEOS 386SX is simply the best money can buy. Because ZEOS knows '386 systems better than anyone. After all, PC Magazine chose ZEOS above 57 other manufacturers *"For Overall Excellence"* in their '386 Blockbuster issue.

The new ZEOS 386SX simply runs circles around every other 386SX out there (not to mention all those '286 based machines). As PC Magazine noted, the ZEOS 16MHz 386SX compares "favorably with the 20MHz '286 machines reviewed in 'The 80286: Unsafe at Higher Speeds?'" (PC Magazine, December 27, 1988).

So if you're in the market for '386 power at a terrific price, you may as well get the best money can buy. The

ZEOS 386SX. Nothing can touch it. It's the Editor's Choice, and it's your best choice as well.

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Price	\$2,795	\$3,499

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CIRCLE 165 ON READER SERVICE CARD

First Looks

Hands-on Reviews of the Latest Products

17-ppm, Networked HP LJ IIISi: Fast, Loaded with Options

HANDS ON
by Alfred Poe

Once again, Hewlett-Packard has redefined the laser printer. The HP LaserJet IIISi is a 17-page-per-minute machine designed for shared and network printing. With its list price of \$5,495, the IIISi continues HP's tradition of putting aggressively low prices on quality products.

I used to joke that if you wanted twice the speed and paper capacity of a LaserJet III at no more than twice the cost, you bought two LaserJet IIIs. That's no longer true—the IIISi is more than twice as fast, and better still, it costs only slightly more than twice the price of its smaller stablemate.

Some IIISi features are similar to the other LaserJet III models. In addition to the standard 300-dot-per-inch resolution, its Resolution Enhancement Technology increases the effective resolution by modulating the size and placement of the dots. The net effect is strikingly sharp text with smooth curves, even at smaller point sizes. The front panel uses the same raised, lit switches and LCD window as found on the LaserJet III.

In fact, if you can set up a LaserJet III, the chances are good that you can set up a IIISi without even reading the instructions. But go ahead, read them; Hewlett-Packard has come up with a "Use Me First!" booklet that makes installation as simple as possible. And, once you get over the shock of seeing what looks like a LaserJet IIID case on steroids (the unit is 16.5 inches tall and tips the scales at a hefty 123

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PHOTOGRAPH BY WALT CHRYNWSKI

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123 pounds of network heft with the HP IIISi.

NEC and Panasonic 286s Challenge Zeos Notebook

HANDS ON
by Matt Jones

Zeos has been so successful with its \$1,995 Notebook 286 that the company has struggled to keep production levels in line with the tremendous demand. The latest notebook laptops to hit the retail shelves—the NEC UltraLite 286F and Panasonic CF-270 Business Partner—look to relieve the problem.

Both machines weigh slightly less than the 7-pound Zeos—6.8 for the UltraLite 286F and 6.9 for the Panasonic CF-270—and come with a 3.5-inch floppy drive and 20MB hard disk. At first glance, the \$2,999 NEC and the \$3,199 Panasonic seem much more expensive than the \$1,995 Zeos Notebook 286-12, but expect hefty discounts. NEC estimates street prices below \$2,000, and while Panasonic declines to give specific figures, a price be-

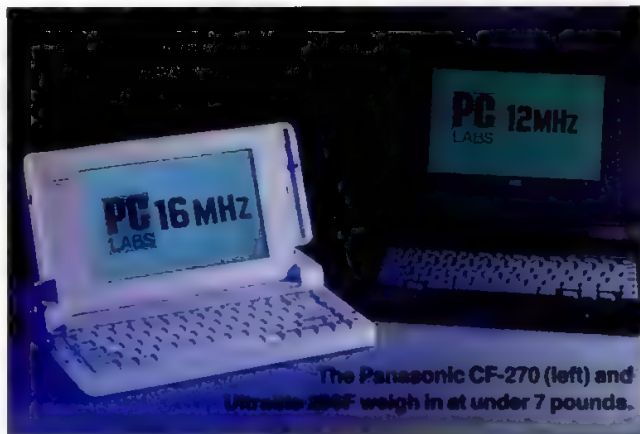
low \$2,500 seems certain.

Measuring 2 by 11.5 by 8.5 inches (HWD), the UltraLite 286F feels mammoth compared to the original UltraLite, but NEC has done an admirable job of ensuring that the step up in size affords a commensurate step up in quality and features. On PC Magazine Labs' battery

rundown test, the 1.1-pound, removable battery pack powered the UltraLite 286F for 3 hours and 51 minutes, exceeding its 3.5-hour rating, and far superior to the original UltraLite's 1.5-hour life. The sculpted keyboard and sturdier construction of the UltraLite 286F also show real improvement.

The 286F's 80C286-12 processor, built-in floppy and hard drives, 80287 math coprocessor support, and complete selection of standard I/O ports (a standard

CONTINUES ON PAGE 35



PHOTOGRAPH BY THOM O'CONNOR

First Looks

HP IIISI

CONTINUED FROM PAGE 33

pounds), you'll settle into familiar territory. The toner and drum come in one single cartridge, making installation and maintenance easy. The IIISI has its own toner cartridges, however; these contain special micro-fine toner and are rated for a whopping 8,000 pages—twice that of LaserJet III cartridges.

You also get two paper trays that hold 500 sheets each. Since you are able to configure the printer to change trays when one runs out, you get an impressive 1,000 sheets on-line without refilling. You can also feed sheets manually on either tray without removing it. In addition, there are options for paper handling: a \$495 envelope feeder (available this summer) that holds up to 100 envelopes (and is mounted to the two paper trays) and a \$695 duplex printing option. The duplex feature, which allows you to print on both sides, is slick and simple. All you do is take out six screws to remove parts of the case and an internal panel, then slide in a large tray and replace the same six screws.

The IIISI offers both face-up and face-down paper output,

and unlike other LaserJet models, you can select the output mode via software commands. Print jobs can be offset by an inch to make it easier to separate them, and the face-down output bin can hold up to 500 sheets. There is even a clever arm that can be mounted above the output bin; it will take the printer off-line when the bin is full.

The IIISI comes with the typical collection of resident LaserJet III bitmapped fonts (Courier and Line Printer), plus scalable outlines for CG Times, Univers, Univers Condensed, and Zapf Dingbats. Since the printer uses the PCL5 printer control language, the scalable fonts can be printed in any of four directions. By converting them to HPGL plotter language format within the printer controller, they can even be printed at a variety of angles and with special effects such as patterned fills.

For additional fonts the IIISI has an Adobe PostScript option that lists for \$895 (it needs to be installed by a dealer) and comes with the full complement of 35 scalable Adobe Type 1 fonts. You can also get the IIISI with PostScript installed at the factory (available this summer); this model comes standard with 2MB RAM, compared with the 1MB on the base unit, and car-

ries a list price of \$6,595. You will need 2MB for PostScript printing, 4MB for duplex PostScript printing. Unlike some of the other PostScript implementations on LaserJets, you can switch command modes via software commands.

For additional memory the IIISI uses standard SIMMs (1MB and 4MB). You can install up to four pieces for a total of 5MB to 17MB. No special memory expansion card is required, and you can install the memory yourself if you like.

While all this sounds impressive, the big question remains: How well does it perform?

The answer is simple: like a LaserJet. Thanks to the Resolution Enhancement Technology, the text is crisp and clear. The print engine works well, producing large areas of black that are solid, with sharp edges and no hint of uneven toner coverage.

And it is fast. Under PCL, it managed 3.5 graphics pages per minute in the PC Magazine Labs printer benchmark tests, which is almost twice as fast as the LaserJet III or IIID. The PCL text speed is an even 15 pages per minute for single-sided printing, precisely twice that of the III and IIID, and 11.7 pages per minute in duplex mode, compared with 6.4 for

**FACT FILE**

HP LaserJet IIISI
Hewlett-Packard Co., 19310
Pruneridge Ave., Cupertino, CA
95014; 800-752-0900.

List Price: Base model with PCL5 and 1MB RAM, \$5,495; with PostScript upgrade and 2MB RAM, \$6,595; PostScript upgrade, \$895; toner cartridge, \$169; envelope feeder, \$495; duplex printing option, \$695; 1MB SIMM, \$169; 4MB SIMM, \$499; Ethernet expansion interface, \$695; Token-Ring expansion interface, \$795.

In Short: Hewlett-Packard takes the lead in the fast-growing shared/network printer market with its introduction of the 17-ppm LaserJet IIISI. Buy only the features you need with this expandable printer, and get high-speed, high-quality output at an impressively low price.

CIRCLE 435 ON READER SERVICE CARD

the IIID.

PostScript times are also fast—1.1 graphics pages per minute and 14.5 pages per minute for text compare favorably with last fall's printer issue Editors' Choice, the QMS PS-2210, which posted figures of 1.0 gppm and 17.3 ppm for text. The QMS carried a list price nearly twice that of the IIISI PostScript model.

The only problems we encountered in our testing was in PostScript compatibility. The controllers' performance suffers dramatically when you send a PostScript print stream across a parallel connection using PostScript's Executive mode. This is not an uncommon problem, however, and is not likely to affect performance with most PostScript applications.

There is a lot to like about this printer. The base model is fully functional, but there are lots of options you can add if you need them. The result is that you buy only the features you need, making this affordable printer an even better value. HP has also lined up third-party vendors to provide a variety of support products for this new printer, from software drivers to sharing devices.

It's obvious that HP has once more set the pace in the laser printer market. ■

MAKING IIISI CONNECTIONS

The new IIISI base model comes with just parallel and serial ports—one of each—and you must configure the printer for either one or the other. This is less capability than some other shared printers, which often offer multiple ports that can all be active at the same time. You don't need

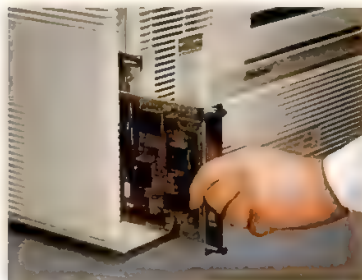
these extra ports in many installations, however, where you attach the printer to either a local area network file server or printer server for shared access.

The IIISI's flexible design allows you to go beyond these two basic options. HP offers Ethernet and Token-Ring in-

terface expansion cards that allow you to hook your printer directly to a NetWare or 3+Open network without using a dedicated print server. HP has also lined up a number of third-party manufacturers to provide additional options, some of which offer a wide range of features. For example, Extended Systems of Boise, Idaho, offers automatic language switching between PCL and PostScript, multiple active printer ports, and AppleTalk support for the IIISI.

In typical HP fashion, the IIISI is hitting the street as a mature product with broad support. Chances are excellent that you can find a combination of add-ons that will enable you to configure it to your specific needs.—AP

HP's Ethernet (shown here) or Token-Ring expansion cards allow you to connect directly to the network without a dedicated print server.



PHOTOGRAPH BY WALT CHRYNWSKI

First Looks

286 Laptops

CONTINUED FROM PAGE 33

parallel and a 9-pin serial port, an external CGA monitor connector, and an FDD connector) should also appease UltraLite detractors.

The black-and-white film-compensated LCD provides another area of possible complaint, but here, too, the apparent disadvantage seems more like a boon. The 9-inch, double-scan CGA display offers a top resolution of 640 by 400 with no pretense of handling VGA graphics, but its electroluminescent (EL) backlighting and VGA text font provide text screens that even the best VGA displays can't rival.

Other notable features include NEC's extensive disk-based documentation and the machine's prolific battery conservation features. Sensors automatically shut down the I/O ports and LCD backlighting when the I/O or display panels are closed.

The 2.5-inch PrairieTek hard drive is slower than the Conner drive used in the Panasonic CF-270, but its quick spin-up time comes out of hard disk shutdown in only two seconds, half the time required by the Panasonic.

The UltraLite 286F falls short in NEC's price for peripherals. Both offer 1MB of RAM, expandable to 5MB, but the Panasonic upgrade costs \$1,476, compared to \$1,999 for NEC. Likewise, Panasonic's 2,400-bit-per-second internal modem costs \$199, while NEC's lists for \$499, or \$799 for a send/receive fax version.

The CF-270 Business Partner lacks the UltraLite 286F's more thoughtful features and its attractive overall appearance, but the CF-270 boasts advantages of its own, including its 16-MHz 286 performance, 9-inch VGA display, and true resume mode that will preserve the contents of RAM for up to four weeks.

The edge-lit, film-compensated LCD used in the Panasonic is the same capable sub-

system made by Sharp and used in numerous VGA laptops, including the Sharp, Texas Instruments, and CompuAdd 286 notebooks, and the Compaq LTE/386s. Like all current fluorescent backlit VGA screens, it suffers from some bleeding and edge discoloration, but the 16-shade VGA graphics rate no less than wonderful. Our most serious complaint concerns Panasonic's loopy screen font.

The CF-270's keyboard is a strong feature. As with the UltraLite 286F, layout is superb, with a sculpted shape, but the CF-270 boasts a lighter feel—like that of a desktop model.

The CF-270 comes with a more enticing array of I/O ports than that of the UltraLite 286F, thanks to its external VGA monitor and PS/2-style keyboard connectors. The back panel also accommodates a standard parallel and 9-pin serial port.

Panasonic rates the CF-270's removable, 0.8-pound battery pack at 3 hours, but this

figure proved optimistic. It lasted 2 hours and 9 minutes on our rundown test. Dimming the display added about 15 minutes of computing time. You'll have to make use of all of Panasonic's conservation utilities to squeeze 3 hours out of this battery.

The CF-270 is respectably thin for a machine with its features—1.75 inches—but stretches to 12.2 inches wide and 10 inches deep, large enough to make suspect its notebook moniker. Construction is unquestionably solid.

If the Panasonic CF-270 Business Partner looks similar to Tandy's forthcoming 2810 HD, it is for good reason: Tandy and Panasonic produce the laptops as a joint effort.

Which of these laptops, if either, is for you? If you'll be using your bargain-priced laptop primarily for word processing, e-mail, and other text-based tasks, the NEC UltraLite 286F with its crisp display, 3.5-hour battery life, and thoughtful de-

sign should land near the top of your list of prospects.

It's difficult to see precisely where the Panasonic CF-270 fits in. If you need a 16-MHz notebook laptop with VGA graphics, you're probably better off with a 386SX. The CF-270 is a fine machine; it just fails to offer a compelling feature mix at its current price.

List Price: NEC UltraLite 286F, \$2,995 (includes DOS 4.01); upgrade to 2MB RAM, \$499; extra battery, \$149. NEC Electronics Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; 508-264-8000.

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List Price: Panasonic CF-270 Business Partner, \$3,199 (includes DOS 4.01); upgrade to 3MB RAM, \$738; extra battery, \$99. Panasonic Communications and Systems Co., Two Panasonic Way, Secaucus, NJ 07094; 800-742-8086.

CIRCLE 707 ON READER SERVICE CARD

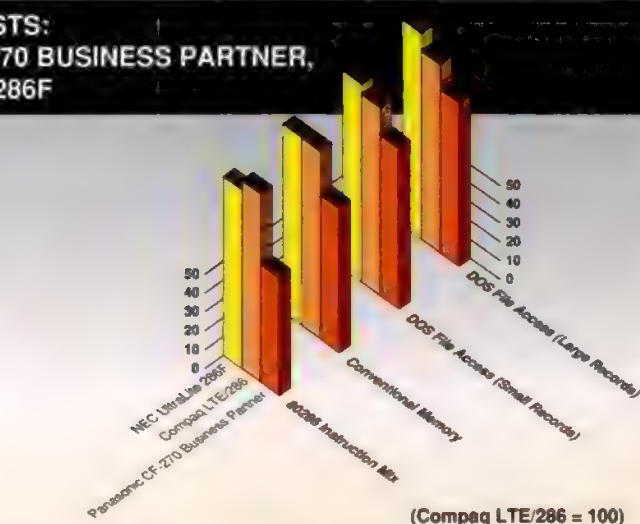


BENCHMARK TESTS: PANASONIC CF-270 BUSINESS PARTNER, NEC ULTRALITE 286F

The faster 16-MHz clock speed of the Panasonic CF-270 Business Partner accounts for its performance edge over the 12-MHz NEC UltraLite 286F and Compaq LTE/286.

The **80286 Instruction Mix** benchmark test times a series of tasks specific to the 80286 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.



The **DOS File Access (Small Records)** benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. The test is performed without software disk caching. Fast times are advantageous for programs that work with many short segments of data.

The **DOS File Access (Large Records)** benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. This test minimizes the effect of small hardware caches on disk subsystem performance. It is performed without software disk caching. Fast times are advantageous when large files are loaded.

Performance Times (Times given in seconds)	80286 Instruction Mix	Conventional Memory	DOS File Access (Small Records)	DOS File Access (Large Records)
NEC UltraLite 286F	5.84	0.93	81.48	9.28
Compaq LTE/286	6.12	0.93	77.81	8.48
Panasonic CF-270 Business Partner	3.88	0.72	66.53	7.35

First Looks

Mannesmann Tally Portable "LaserJet" Redefines Printing on the Road

HANDS ON
by Matthew J. Frost

The Mannesmann Tally MT 735 portable page printer is not a laser printer, but it comes pretty darn close. The thermal transfer ink technology mimics a laser, printing entire pages at once via the HP LaserJet Series II emulation, PCL-4. And while the 8.6-pound, \$1,295 printer is heavier and also more expensive than other portable printers, its output quality, particularly with graphics, is absolutely unmatched.

Physically, the MT 735 is the size of a ream of paper, 2.3 by 8.5 by 11 inches. The printer is incredibly dense, and it seems heavier than its 8.6 pounds (9.6 with its AC adapter). It fits neatly into a laptop carry bag, and when opened, the unit features a built-in 80-page cut-sheet paper

feeder. A series of oragami-like folds extends the paper tray or returns it again to its closed position; the process is roughly equivalent to correctly refolding a road map. The MT 735 has a definite advantage over the Canon BJ-10—whose automatic sheet feeder is a ponderously sized option—or the portable Diconix units, which require continuous-feed paper.

The MT 735 gets its power from a nonremovable 18-volt, 1.2-Ah nickel cadmium battery back. Charging the pack is a slightly underpowered 24-volt, 400-mAh AC adapter. There is no internal power supply; Mannesmann Tally has admitted that none was available to fit in the MT 735's small form factor. The battery pack is the only source of power, even when the MT 735 is plugged into an AC outlet. And though the battery

**FACT FILE**

MT 735
Mannesmann Tally Corp.,
8301 S. 180th St., Kent, WA
98032; 800-843-1347, 208-
251-5524.
List Price: \$1,295; five
replacement ink ribbons, \$75.
Requires: Centronics parallel
interface cable.
In Short: Portable LaserJet
emulation printing for a street
price below \$1,000 is a
breakthrough, but the high cost
of thermal transfer technology
and the unit's battery life are
limitations.

CIRCLE 796 ON READER SERVICE CARD

lasts a healthy 2 hours or 150 text pages of continual printing, the recharging of it takes 8 hours, due to the AC adapter's limitations. No quick charge is currently available. The number of pages that the thermal transfer ink ribbon roll produces before needing a replacement is also 150.

In fact, the cost of consumables for thermal transfer-based printers is a major factor for consideration. The MT 735's ink ribbon rolls are \$15 each. The thermal transfer technology is optimized by using special coated laser paper, not the standard 20-pound rag-based paper for photocopiers that is so readily available. The coated paper is an additional expense, anywhere from 2 to 5 cents per page, compared with the penny-per-page cotton rag paper. The output is acceptable with standard cut-sheet paper, but significantly better with the coated paper.

The combination of special coated paper (Mannesmann Tally recommends either Hammermill Laser Plus 10450-5, Georgia Pacific Nekoosa Laser 1000, or Weyerhaeuser First Choice) and the thermal ink ribbon rolls add up to a more expensive cost per page than you'll have with other portable printers, such as the Canon BJ-10 ink jet or the new Seikosha LT-20 24-pin dot matrix. In addition, both these units are less expensive; they sell in the \$400 to \$500 price range.

Where Mannesmann Tally's

MT 735 portable page printer shines in contrast to the competition is in its font and emulation support. While the Seikosha and Canon are limited to IBM Proprinter emulation, the MT 735 has the ability to accept Hewlett-Packard PCL-4 (LaserJet Series II), HP DeskJet Plus, IBM Proprinter, and Epson LQ-850 emulations.

Under the LaserJet Series II emulation, the MT 735 averaged a speedy 6.3 text pages per minute for a 20-page document and 1.4 graphics pages per minute on PC Magazine Labs' printer benchmark tests. Available fonts include Courier, Courier Bold, and Line Printer, and the Mannesmann Tally unit had no problems with bold, underline, italic, superscript, and subscript printing. The PCL-4 compatibility was nearly flawless, including the ability to print in landscape mode. There was only a minor glitch on a PCL-4 permanent macro command.

Support for additional soft fonts is also provided. The printer features 1MB of RAM, with 178K set aside for downloaded soft fonts, plus a 50K input buffer. A three-setting switch on the control panel determines the ink density, but output quality did not differ much from one setting to another. Output resolution is 300 by 300 dots per inch, although it may appear splotchy with non-coated paper. Output for transparencies is excellent. A noteworthy convenience feature is a copy button that allows for multiple copies of the last page printed.

Until now, no portable page printer provided LaserJet Series II emulation. The MT 735 offers the speed and paper handling of a laser, as well as PCL-4 with all of its added printing capability (including support for full-page graphics and downloadable fonts), for a street price of under \$1,000. Drawbacks are the limited battery life, the higher cost per page due to the consumables, and the heavier weight and more expensive price compared with other portable printers. Still, for what the MT 735 does, no other printer can match it. ■



Offering thermal transfer technology and LaserJet Series II emulation in a portable package, the \$1,295 MT 735 handles demanding graphics as fast as some laser printers.

You get **5** fonts with the Starter Kit **PLUS A FREE BONUS!**

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- | | |
|---|---|
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| ☐ Baskerton | ☐ Jewel |
| ☐ Capelli | ☐ Joulliard |
| ☐ Century | ☐ Katrina |
| ☒ Corporate | ☐ Letter Gothic |
| ☐ Corporate Condensed | ☐ Obelisk |
| ☐ Courier | ☐ Oxford |
| ☐ Eterna | ☐ Padua |
| ☐ Futuri | ☐ Prestige |
| ☐ Garamand | ☒ Roman |
| ☐ Garamand Condensed | ☐ Souvienne |
| ☐ Gazette | ☐ Top Hat |

Decorative Fonts

- | | |
|--|--|
| ☐ Aero | ☐ Gettysburg |
| ☐ Army Black | ☐ Greek AB&f 01 |
| ☐ Bongo Black | ☐ Guthrie |
| ☐ Buckingham | ☐ Harem |
| ☐ Circus | ☐ Manuscript |
| ☐ Classic Typewriter | ☐ New York Deco |
| ☐ Copperfield | ☐ Nuts |
| ☐ Coronation Script | ☐ PENWIN |
| ☐ Dateline | ☒ Rockland |
| ☐ Dateline Condensed | ☐ University Ornate |
| ☐ Diner Script | ☐ Waldorf Script |
| ☐ Don Casual | ☒ Zingbats  |
| ☒ Exchequer Script | |

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First Looks

Sidekick 2.0 Takes a Pivotal Info Management Position



Borland's original *Sidekick* helped the newly introduced PC catch fire. The first widely available TSR (terminate and stay resident) program, *Sidekick* virtually defined desktop organizers as a software category. At the touch of a hotkey, users could access a suite of useful utilities without leaving their foreground applications.

Since *Sidekick*'s introduction, personal information managers (PIMs) have eclipsed Borland's original TSR organizer to some extent by offering a wider range of functionality and tighter integration among individual tools. Programs like Chronos Software's *Who-What-When* and Chronologic's *Instant Recall* have built on *Sidekick*'s original premise, adding features that help business people cope with life in an endlessly complicated workplace.

Sidekick 2.0, Borland's long-awaited overhaul of the original TSR, emphasizes two key areas in its bid to reestablish itself as the personal organizer of choice. First, Borland has incorporated *Paradox* database technology into *Sidekick* 2.0.

The time planner, address book, and communications modules all read and write standard *Paradox* files. This is in keeping with the company's ambitious plan to maximize interoperability and data portability among its products, with *Paradox* as the functional glue that ties everything together.

Sidekick 2.0 users will theoretically be able to import and use any database information in the appropriate format. Conversely, *Sidekick* files can easily be exported and manipulated or used to generate elaborate reports. Second, Borland has enhanced *Sidekick*'s ability to work with other organizing tools, both electronic and paper-based. (See sidebar, "Sidekick: A Data Docking Station.")

Borland positions Version 2.0 as a full-fledged suite of applications rather than a collection of utilities like *Sidekick Plus*. The new product documentation optimistically points out that 2.0 takes up "only" 40K RAM when installed as a TSR, which seems like an unduly large chunk compared with the mere 3K to 5K required by competing TSRs.

Though *Sidekick* 2.0's core applications have gained in so-

**FACT FILE**

Sidekick, Version 2.0
Borland International Inc., 1800 Green Hills Rd., P.O. Box 660001, Scotts Valley, CA 95067; 408-438-5300.
List Price: \$99.95.
Requires: 512K RAM, 3MB hard disk space, DOS 2.0 or later.
In Short: Borland's pioneering TSR has been updated to work together with other software and with the various devices other than PCs that proliferate in the modern office.

CIRCLE 711 ON READER SERVICE CARD

phistication and functionality, users of previous versions will instantly recognize most of the options listed in the main menu: notepad, time planner, address book, calculator, and communications modules. The user interface, however, has been substantially overhauled to comply with the CUA standard.

While it offers many of the amenities of graphical interfaces, including pull-down menus and full mouse support, Version 2.0 is still character-

based and lacks the visual elegance that graces *Windows* applications. Borland is at work on a true *Windows* application, but for now *Sidekick* 2.0 runs under *Windows* 3.0 as a full-screen application.

Even though *Sidekick* 2.0 is positioned as a solution to the same problems that PIM packages tackle, *Sidekick* lacks at least one feature that would make it a true PIM. There is no global search function that allows whole text searches across all of the software's modules. Since all of the individual modules are searchable, this isn't a fatal flaw, but future *Sidekick* releases should definitely implement this capability.

Confirmed *Sidekick* users will find Version 2.0 to be a richer, more powerful, and more flexible elaboration on the tools they already know and love. PIM users should take a hard look at *Sidekick* if they seek a more integrated approach to their various laptops, desktops, diaries, and beepers. But the lack of a few key features may prevent dyed-in-the-wool PIM users from making the switch. ■

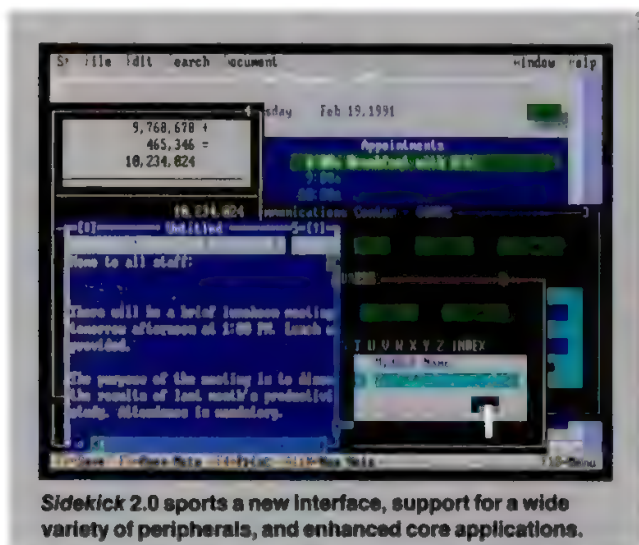
SIDEKICK: A Data Docking Station

Borland International has wisely realized that today's business PC user takes advantage of a wide variety of tools—some as traditional as Filofax-style diaries, others as modern as laptops, telephone pagers, and palmtop organizers like Sharp's Wizard. *Sidekick* 2.0 aims to work harmoniously with all of these tools, with the desktop PC serving as an "information hub" that coordinates and reconciles the flow of information. *Sidekick* 2.0 also supports a variety of network installations (not tested in this review) with full record locking, in recognition of the increasingly connected workplace.

This new thrust gives *Sidekick* 2.0 a unique position among organizer and PIM software. While it may not have the power and flexibility

of *Lotus Agenda* or the functional brilliance of Chronologic's *Instant Recall*, *Sidekick* does allow a degree of freedom that neither of these products allows. A *Sidekick* user could keep a schedule on the Wizard and then transfer updates to the desktop using Sharp's optional cable. *Sidekick* 2.0 merges the data and identifies any conflicts.

Many confirmed PC users refuse to give up their paper-based diaries, and *Sidekick* makes provisions for them as well. The software prints out reports that fit right in with paper-based scheduler/organizers. For those who are tethered to alphanumeric pagers, *Sidekick* 2.0 has the ability to transmit brief text messages (up to 80 characters) from the address book's dialing screen.—JM



Sidekick 2.0 sports a new interface, support for a wide variety of peripherals, and enhanced core applications.

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This bold, new pricing strategy is great news for spreadsheet users. It means now everyone can afford to trade up to the most advanced spreadsheet technology in the industry. And unlike Lotus 1-2-3 3.0 or Excel 3.0, SuperCalc5 runs on virtually every type of PC that exists.

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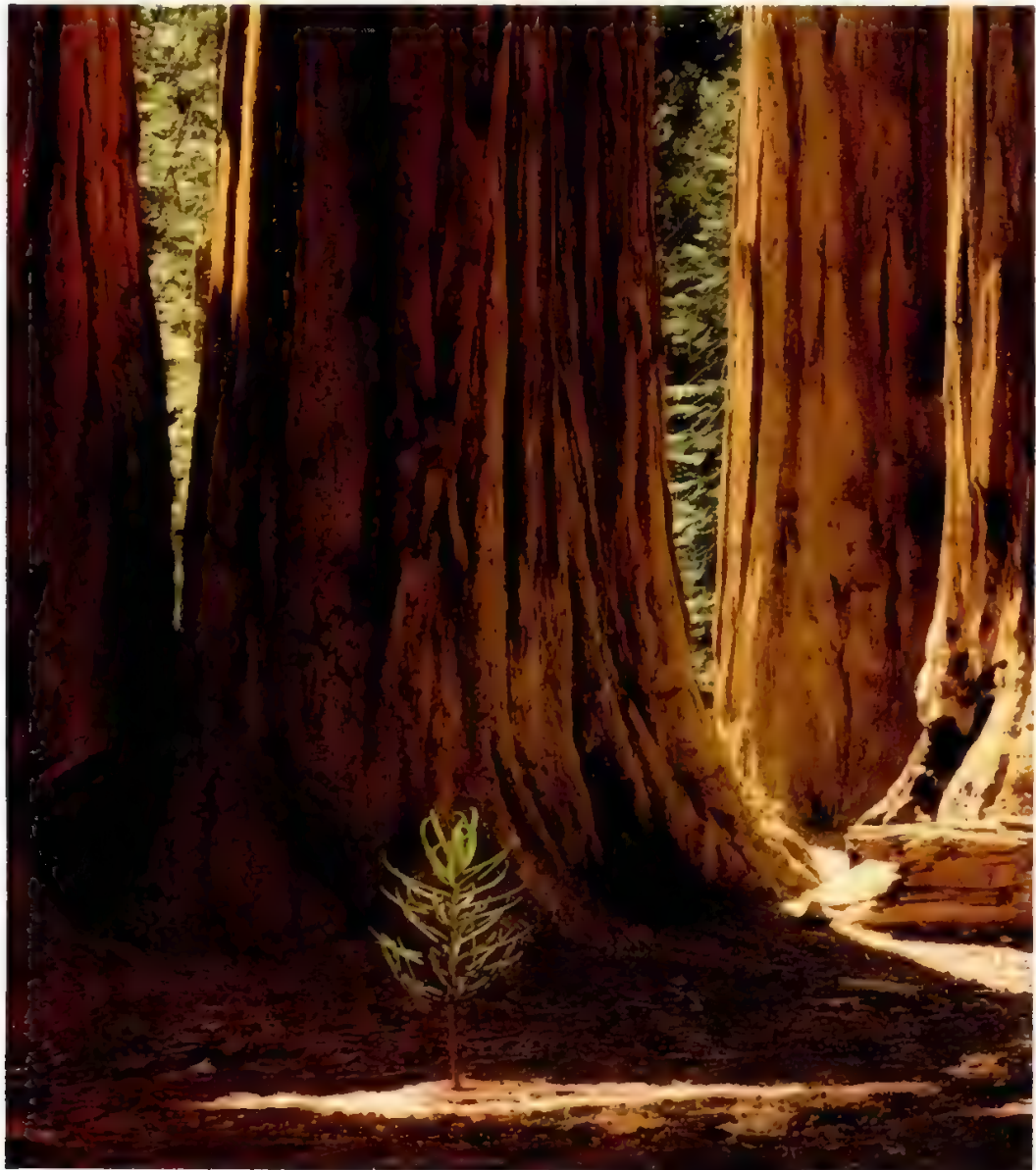
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First Looks

ATI 8514/ULTRA: Anti-Aliased Fonts for Windows

HANDS ON
by Edward Mendelson

ATI's 8514/ULTRA board, with the first fully functional anti-aliased display fonts for *Windows*, is one of the fastest video adapters ever tested in PC Labs. At \$599 with 512K of RAM, and \$799 with 1MB, it provides fast noninterlaced 1,024-by-768 graphics for *Windows*, *AutoCAD*, and any software that supports IBM's 8514/A. The hardware is exceptional, but the software still has some rough edges.

The 8514/ULTRA works the way IBM's 8514/A works in MCA computers: it supplements your existing VGA but doesn't replace it. That means you will need a VGA board in addition to the 8514/ULTRA. The 8514/ULTRA kicks in when you run 8514-level graphics. However, you will be able to choose between running one or driving dual monitors, one plugged into each board.

The 8514/ULTRA ships with on-the-fly scalable outline display fonts for *Windows*. These fonts, stored on-disk, are used only for the screen. ATI's anti-aliasing technique shades the fonts subtly at the edges,

creating a convincing illusion of smooth curves and diagonals. Scaling extends from 1 to 1,024 points. The ATI fonts automatically replace existing screen fonts with the same name, and coexist with other screen fonts, including *ATM* or *FaceLift*.

The Crystal fonts are the highest-quality fonts I've ever seen on a *Windows* screen. Their only disadvantage is the

25K to 50K needed on-disk for each font. In addition to their high quality, they appear at twice the speed of fonts generated by on-the-fly font managers like *ATM*. Other VGA cards that claim anti-aliased font technology like the Edsun chip are still many months away.

ATI ships 13 Bitstream screen fonts corresponding to the 13 basic PostScript fonts. A \$199 supplement (due this spring) will add the 22 remaining fonts for the standard PostScript 35, plus the scalable CG Times and Univers in the LaserJet III, and a utility to convert Type 1 typefaces into Crystal fonts.

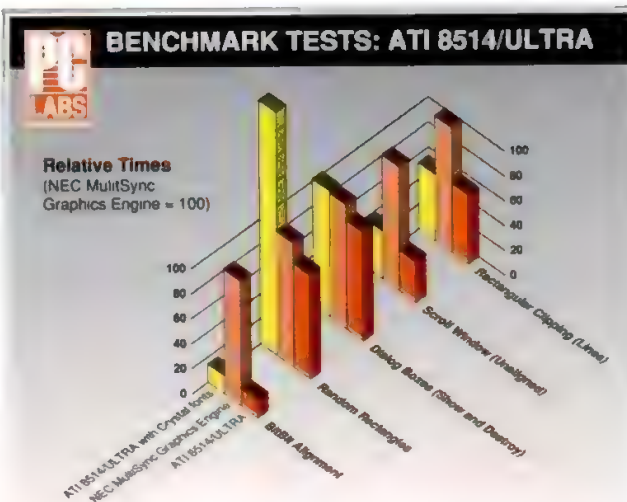
The board ships with two *Windows* drivers: one supports Crystal fonts and one supports normal *Windows* fonts. With 512K RAM, the standard-font provides 16 colors at 1,024 by 768; with 1MB, 256 colors are available. With 512K RAM, the Crystal font driver displays monochrome in 16 shades of gray; with 1MB, it can display 20 pure colors and uses dithering rather than palette-mapping for the remaining 236.

You can install the 8514/ULTRA in either an AT-bus or a Micro Channel PC. Connectors for the two bus styles are on opposite edges of the board.

PC Magazine Labs experienced multiple headaches in installing the 8514/ULTRA. A Compaq Deskpro 386/25 wouldn't boot with the board installed, it did not coexist with the Compaq video BIOS found on the older Compaq Paradise VGA card. Two ATI BIOSes later, we still couldn't get the machine to boot with the Paradise/Compaq card, although we had no problem with a Compaq Deskpro 386/25e, which has Compaq's own VGA circuitry on the motherboard, or with a standard Paradise VGA 16 card.

On my home machine, I could load *Windows* only in real or standard mode, but not enhanced mode, when the 8514/ULTRA coexisted with an STB VGA/16 Plus VGA. Our first copy of ATI's video driver installation for *Windows* asked for the wrong disks, then corrupted the *Windows* disks, but a later set got it right. To change drivers, I had to reinstall *Windows*. ATI claims to have fixed the problem in its most recent version.

ATI's BIOS and installation are still a moving target, but the hardware is the fastest you can find, and the fonts—once installed—are faster and clearer than anything on-screen. ■



In spite of the speed penalty imposed by the anti-aliased on-screen Crystal fonts, the 8514/ULTRA performed extremely well under *Windows* 3.0.

Graphics Performance Tests for Microsoft Windows

The **BitBit Alignment** test uses the *Windows* function BitBit (bit-block transfer) to move a square block of pixels rapidly from one location to another.

The **Random Rectangles** test draws randomly sized rectangles in random colors.

The **Dialog Boxes (Show and Destroy)** test generates and erases a *Windows* dialog box 20 times.

The **Scroll Window (Unaligned)** test scrolls unaligned text vertically through a rectangular window.

The **Rectangular Clipping (Lines)** test for *Windows* creates four separate, equal, rectangular windows on-screen with space in between them. A full-screen image composed of solid lines is then clipped to the windows.

The ATI 8514/ULTRA was tested in conjunction with an ATI VGA Wonder+ video adapter on a Compaq Deskpro 386/25 with 4MB RAM with an NEC MultiSync 5D monitor. The NEC MultiSync Graphics Engine scores are provided for comparison purposes. All tests were performed at 1,024-by-768 resolution with 256 colors and noninterlaced video output.



FACT FILE

ATI 8514/ULTRA

ATI Technologies Inc., 3761 Victoria Park Ave., Scarborough, Ontario, Canada M1W 3S2; 416-756-0718.
List Price: \$599 (with 512K RAM), \$799 (with 1MB).
Requires: VGA adapter and a 1,024-by-768 monitor.

In Short: One of the fastest video boards ever tested by PC Magazine Labs, the ATI 8514/ULTRA has superb fully functional anti-aliased display fonts. Installation and compatibility, however, are somewhat problematic.

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Performance Times (Windows tests: in milliseconds)	BitBit Alignment	Random Rectangles	Dialog Boxes (Show and Destroy)	Scroll Window (Unaligned)	Rec- tangular Clipping (Lines)
ATI 8514/ULTRA with Crystal fonts	3.29	8.06	321.87	7.17	0.34
NEC MultiSync Graphics Engine	22.92	4.13	316.47	18.71	0.64
ATI 8514/ULTRA	3.30	3.47	277.70	6.21	0.38

First Looks

Sagacity Automates Resource Assignments

HANDS ON
by Henry Ford and Steve

Sagacity addresses one of the knottier problems of project planning—how to assign resources, both human and physical. Resource managers have traditionally relied on paper, pencils, and their best guess as to who should work on which tasks.

Sagacity automates the process by allowing the resource manager to rank the most important criteria for making assignments—time, money, and task importance. The manager enters basic information on resources and tasks, applies the program's built-in rules governing assignments, and then lets the program's "artificial intelligence" engine take over to reconcile tasks and resources.

At the heart of the program are the rules the inference engine uses to make its decisions regarding resource assignments. These rules fall into two categories: task importance and resource allocation.

A task is ranked in importance based on three factors: priority, criticality (the amount of effort necessary compared to

the time available), and skill scarcity. By choosing one of seven scenarios you prioritize these items. One scenario, for example, tells the program to consider the task with the least time to spare as the most important, followed by the task requiring the scarcest resource-skill, and so on. The program assigns an internal index number to each task. If two tasks are ranked identically on the first criteria, the program moves to the secondary criteria to make the tie-breaking decision.

You can list up to ten required skills per task and indicate an order in which they should be accomplished. You also indicate how long a task should take, its priority, earliest start date, due date, a code, what percentage of full time a skill is required, and whether or not the resource assignment can be split and/or interrupted.

Resource assignments are based on a different set of rules. These tell the program in which order to consider factors of time (the skill efficiency of a resource as measured by a standard hour multiplier—SHM), cost, and degree to which the resource is busy or idle. If two re-

**FACT FILE**

Sagacity
Erudite Corp., 533 Airport Blvd., #400, Burlingame, CA 94010; 415-348-7714.
List Price: \$1,595; annual maintenance fee, \$240.
Requires: 640K RAM, hard disk, DOS 3.0 or later.
In Short: *Sagacity* automates the resource assignment process by using artificial intelligence techniques based on rules for task importance and resource preferences, but the program has a limited capacity and is expensive.

CIRCLE 708 ON READER SERVICE CARD

sources fit all the criteria, you can tell the program to break the tie automatically or manually.

For each resource you enter the name, title, code, dates available, a holiday set, and cost per hour. In addition, you can enter up to ten skills and a SHM number for each skill. Because resources can have more than one skill, you get a chance to mirror reality much more closely than with the typical project management program. Jim Smith may be one of your best steering wheel designers, but in a pinch he can also do brake design and he's a competent CAD operator. Not only can you record these secondary skills, but you can also indicate his level of expertise by ranking each skill with a number from 0.5 to 2.0 in the SHM field.

With the rules set, and the task and resource information entered, *Sagacity* generates assignments in a matter of seconds. You can review the assignments in a number of ways. A color-coded bar chart shows the scheduled time for each resource. These bar charts can show all your resources—each on a separate line or individually listed by assigned tasks. Color-coded histograms show the extent that each resource is used. They can focus on tasks, individual resources, resource groups, or skills.

In addition, *Sagacity* offers tabular reports. The Information Report details all assignments by task, resources, and skills. The Resource Informa-

tion Detail displays the resource's assigned task, skill, task priority, work effort, start and end dates, and projected days late or early.

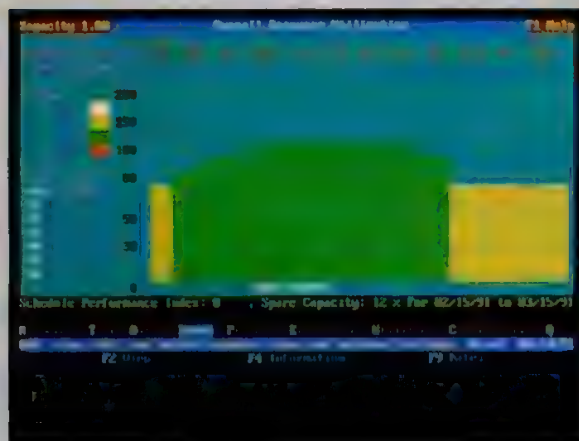
These graphic and tabular views can all be printed using selection criteria, date ranges, and sorting. *Sagacity* supports a wide range of printers and also supports all plotters that are HPGL compatible.

Sagacity is not a project management program; its focus is purely on resource assignment and it does not use the critical path method. But the resource and task information *Sagacity* asks you for is fairly complete and easy to enter. The one area where *Sagacity* should but doesn't supply much information is in costs. You can't indicate one-time costs or overtime rates.

In addition, the program limits the amount of data you can enter. Depending on the complexity of your information, you could conceivably begin running out of memory while tracking 25 people who have 6 leave periods, 10 holidays, and are assigned to 100 tasks. These limits indicate that the program was created for a single resource manager, not for a large site with multiple resource managers.

Because you choose the rules governing both task importance and resource assignment, *Sagacity* can be molded to adhere to company mandates, departmental policy, or personal decision-making preferences. It approximates the noncomputerized resource management process—but it's faster and more consistent. *Sagacity* can also work well in organizations that don't have formal projects, but have projects with many independent resource driven tasks.

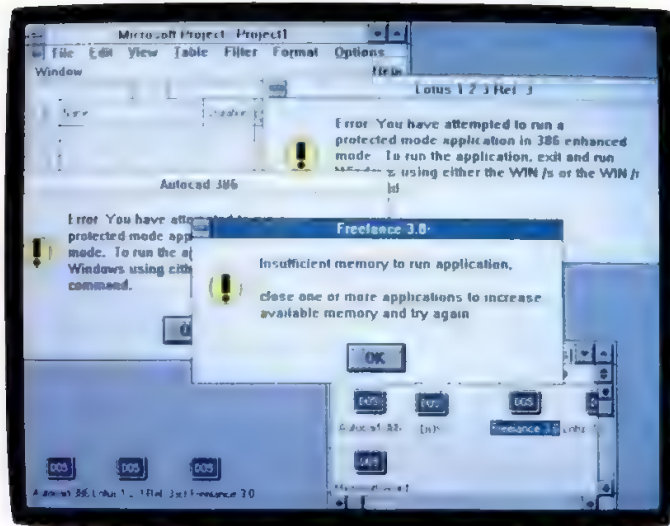
Sagacity's wisdom is not inexpensive. The \$1,595 program has an annual maintenance fee of \$240. The maintenance fee entitles you to free updates, unless it involves a considerable change to the product, such as a new module. By focusing on resource management, *Sagacity* is an ideal—albeit expensive—adjunct to project management. ■



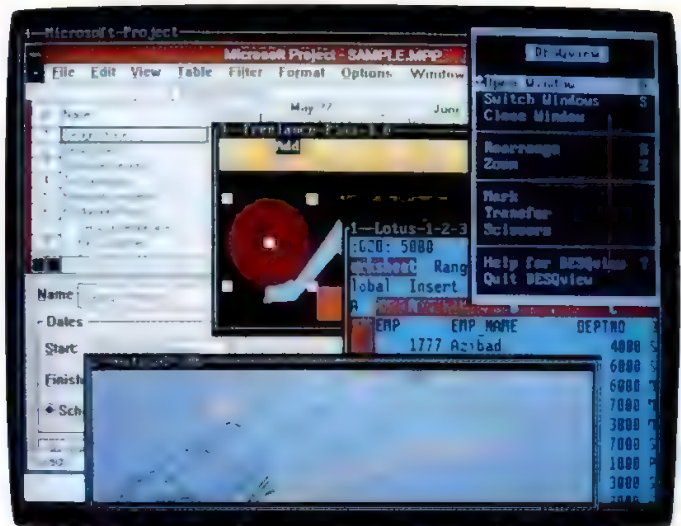
Once the task and resource data is entered, *Sagacity* creates resource utilization diagrams and reports. Here we see overall resource utilization during 1991.

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within DESQview 386. So the next time you get error messages like the ones at the left in Windows, remember how the same set of programs look running in DESQview.

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Quarterdeck

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (213) 392-9851 Fax: (213) 399-3802

This comparison was made using a system like the one you might run: Both shots show an ALR FlexCache 33/386 running DOS 3.3 with VGA display adaptor, Novell NetWare v3.01 Rev. A, with IPX/SPX v3.01 Rev. A, Microsoft Mouse 7.00, and Microsoft SMARTDrive v3.03 disk cache. Buffers were set to 20.

For the Windows screen, we ran Microsoft Windows 3 HMEM.SYS and EMM386.SYS. For the DESQview screen, we ran QEMM 386 v5.1.

Trademarks: Microsoft, Windows, MS-DOS, 80386, 486, ALR, FlexCache, Novell, NetWare. ©1990 Quarterdeck Office Systems

First Looks

AT&T's TOPAS Animation Package Moves to VGA

HANDS ON
by Luisa Simone

What's the difference between a high-end graphics workstation and the PC that is on your desk? If your current system includes a VGA adapter, 2MB of expanded memory, and a math coprocessor, the answer is not much. AT&T has just released a new VGA-compatible version of *TOPAS*, its 3-D modeling, rendering, and animation program. With the exception of the VGA-only restriction, the \$2,250 *TOPAS/VGA* is identical to its \$7,995 Targa/Vista-based sibling.

The program's working mode—VGA's 640-by-480 pixels by 16 colors—allows you to apply high-end graphics functions (such as the manipulation of true 3-D geometry, or keyframe animation routines) to wireframe models. *TOPAS/VGA* renders animations at the MCGA resolution of 320 by 200 by 256 colors, instead of the broadcast, photorealistic quality provided by the program's Targa and Vista board versions.

TOPAS and *TOPAS/VGA* share common file formats for 3-D models and animation

scripts, a common interface of drop-down menus, and a common philosophy that stresses ease of use. The Build and Edit menus, for example, employ a simple geometry of polygons and spline curves for constructing 2-D and 3-D objects. An extrusion operation is painless: You stretch the single line "width" of a 2-D outline or letterform into the third dimension. Other geometry functions, such as lathing, drilling, and bending are equally direct.

Likewise, when you are ready to assign surfaces to your created objects, *TOPAS/VGA*'s Texture menu creates special effects, such as wraps or tiled patterns, with ease. Rendering a reflection in a nearly see-through object requires only that you assign a transparency percentage using the Materials Editor, and import a bitmapped file (in .PCX, .GIF, .TIF or .TGA format) into an image buffer.

Other sophisticated rendering techniques include depth cues (like fog), anti-aliasing, bitmapped backgrounds, and one of four shading attributes (Phong, Gouraud, Uniform, and Metallic) which can be applied to entire objects or indi-

**FACT FILE**

TOPAS/VGA, Version 3.6
AT&T Graphics Software Labs,
3520 Commerce Crossing,
#300, Indianapolis, IN 46240;
317-844-4364.
List Price: \$2,250.
Requires: 286-based PC or
better, 640K RAM, 2MB
expanded memory, hard drive,
VGA adapter, math
coprocessor, DOS 3.0 or later,
mouse or digitizing tablet.
(Copy protected.)
In Short: *TOPAS/VGA* brings
easy-to-use, high-end
modeling and animation
functions to VGA-based PCs.
But the VGA-only restriction on
the rendering functions
requires that you still pay the
full \$7,995 price for *TOPAS*
running on a Targa or Vista
board in order to generate high-
resolution animations.

CIRCLE 719 ON READER SERVICE CARD

vidual polygons.

However, there are some tradeoffs between ease of use and advanced functionality. *TOPAS/VGA* cannot create the visually complex, memory-efficient objects that products like Autodesk's *3D Studio* produce. And though the texture and reflection maps are a snap to apply, they are no substitute for the program's lack of bump and opacity maps.

Common-sense commands control the single camera, and the various light sources require little time to learn, but navigating the three-dimensional space is disorienting. *TOPAS/VGA* forces you to accept the camera view as the working screen. So you must actually move the camera to a new drawing plane in order to work with overlapping objects.

TOPAS/VGA relies upon keyframe animation techniques

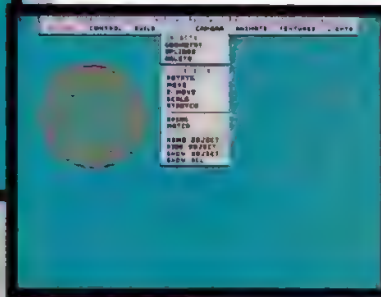
to generate movies. Unlike other animation programs, however, *TOPAS/VGA* does not let you determine the number of frames used to render an animation sequence. You can indicate the time between keyframes, and the kinds of motions and metamorphoses that occur during that period. *TOPAS/VGA* uses the duration and motion path data, as well as hardware-specific information to determine the optimal number of frames per second—usually between 5 and 10. As a result, timing discrepancies can occur if you play back the animation using a different processor. The program handles movement for hierarchically grouped objects, so that mechanical levers and people's arms move logically. Editable scripts in the forms of tables allow you to adjust movement and pacing subtleties.

The VGA-only restriction makes it easy to distribute runtime, disk-based animations to other users (a small playback utility is included), but *TOPAS/VGA* only produces high-resolution images indirectly—via export options. The .DXF or IGES formats link up to high-end CAD programs, but only with wireframe objects. And though you can export Pixar *Renderman*'s .RIB files you'll have to live with the limited number of shaders (surface descriptions) provided with *TOPAS/VGA*. Though AT&T claims that a fix is in the works, the .TGA export is restricted to 8-bit color resolution, which falls below the full 24 bits of which Targa is capable.

Right now, the most efficient way to generate high-res animations is to send native *TOPAS* files from your PC to a full-blown *TOPAS* workstation where the 3-D models and animation scripts can be rendered to video. Users who have access to a *TOPAS* workstation will find *TOPAS/VGA* provides an effective way to create and proof animations. However, this begs an essential question. If the only differences between workstation *TOPAS* and *TOPAS/VGA* are the video resolution, export options, and device drivers, can a price differential of nearly \$6,000 be justified? ■



The wireframe objects in the Edit menu compose a 3-D scene (inset). These objects are then rendered, here using texture maps of the PC Magazine logo.



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CIRCLE 212 ON READER SERVICE CARD

First Looks

Two Internal Power Supplies Add Safety Measures for System Power Failures



Two new internal power supply (IPS) cards—the Powercard from Powercard Supply and the Elgar IPS Card—offer a twist on the traditional uninterruptible power supply (UPS) theme by adding a measure of protection to the way you secure your data.

A traditional UPS provides emergency power for a limited time after normal power is interrupted, but someone must be present (and have the presence of mind) to perform an elegant shutdown to save your data. Both of these IPS cards save your memory's contents automatically, without requiring any operator intervention.

Both IPS cards are connected to their own batteries and sit on your computer's bus. The connector that normally runs from your power supply to the motherboard is plugged into the IPS card instead; the card is then

connected to the motherboard and monitors the power to it. If the IPS senses a power fluctuation it takes control of your computer and uses its battery to keep the computer running long enough to write an image of the computer's memory to your hard disk. When you turn your computer back on you may choose to have it returned to the exact state at which power was interrupted or start fresh.

Powercard Supply's Powercard is a full-length, 8-bit card for the ISA bus that occupies two slots. The slots may be located anywhere on your bus, as long as the power cords will reach the connectors on the motherboard. The battery for the Powercard is a separate unit that must be affixed to the outside of your computer. A cable then connects the two.

The Elgar IPS Card is a half-length, 8-bit ISA card that has the battery mounted on it. Because of the way the battery hangs, it also requires two slots,

unless you have the room and the desire to place it in the first slot, right next to the power connectors.

The battery makes the Elgar IPS Card quite heavy. Since its only support in your computer is from the pin connector to the bus, we do not recommend it for towers or other systems that mount option cards horizontal to the ground.

The installation of these cards is not for the faint of heart; the scant documentation that accompanies them offers little solace. You'll need to find the correct power cords and connect them in all the right places. Simply pulling a connector out and plugging another in could bend or snap a pin and cause major headaches.

To further complicate matters, power connector cords are one of those murky areas of computer construction where everybody does it *nearly* the same way. The subtle differences may make purchasing a special cord to successfully connect the IPS cards a necessity. Fortunately, both Powercard Supply and Elgar anticipated this problem and can supply a variety of nonstandard cords.

Both cards are bundled with software that customizes the save and restore functions for your particular configuration. Both prompt you interactively for information, such as the type of video system you use and how much extended or expanded memory there is on your computer. Both require that a small TSR be loaded to correctly manage saves and restores, and that the TSR be loaded from your AUTOEXEC.BAT file. Powercard's restore option automatically gives you the option of returning to your previous state; the IPS Card allows you to restore automatically, or with prompts. The optional restore with prompts is more sensible, since if a restore is attempted after you change some data, you will erase your changes.

Both programs also require that you have sufficient space available on your hard disk to accommodate the image file that is written when the power fails. You can calculate how

much disk space will be needed by simply adding up the memory that needs to be saved—that is, add together video, conventional, extended, and expanded memory and add to that about 3K for program overhead. In an extreme situation you'll need nearly 10MB of disk space; in our tests, an image file of 2MB was typical.

Despite the setup headaches, our tests indicate that both of these cards work reliably. They both back up as much as 8MB of memory. In our tests, they successfully saved and restored programs and data from conventional, expanded, and extended memory. Both worked with popular DOS applications regardless of whether they were graphics- or character-based applications.

However, both of the cards had problems with *Windows*. The Powercard seemed to have problems with the switch to and from protected mode and therefore would not work with *Windows*' standard or enhanced modes on our 386 machine. Elgar's card locked up if a restore was attempted from inside any *Windows* mode. Both manufacturers indicated they were aware of the problems, and the causes. Software that corrects these problems may be available by the time you read this review.

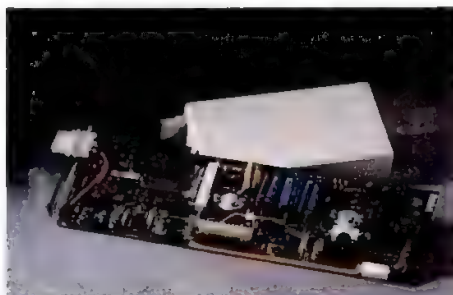
If you want protection from unreliable power sources, and if you need to be especially sure that no data is lost even when you are not around, an IPS card may be for you. The installation and software setup is not easy but the resulting level of security can be important. Make sure to check with the manufacturers to be sure that these cards will work in your computer and with the software you use.

■
List Price: Powercard IPS, \$299. **Requires:** Two available ISA slots, hard disk. Powercard Supply, L.C., 12231 SW 129th Ct., Miami, FL 33186; 800-637-2797.

CIRCLE 704 ON READER SERVICE CARD

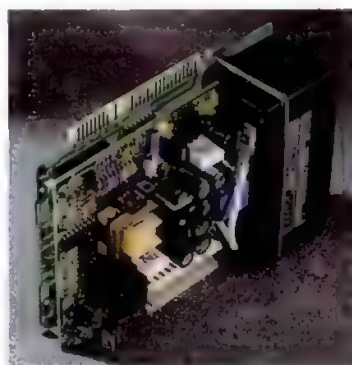
List Price: Elgar IPS Card, \$249. **Requires:** Two available ISA slots, hard disk. Elgar Systems Division, 9250 Brown Deer Rd., San Diego, CA 92121; 619-458-0250.

CIRCLE 705 ON READER SERVICE CARD



The full-length Powercard IPS occupies two slots. The hefty external battery unit needs to be affixed to the outside of your computer.

Elgar's IPS Card is compact, with the battery housed on the half-length board; it still occupies two slots. Both cards save the contents of your computer's memory automatically in the event of a power problem.





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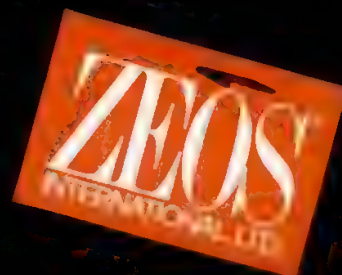
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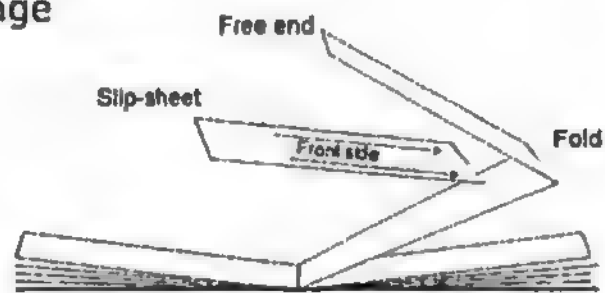
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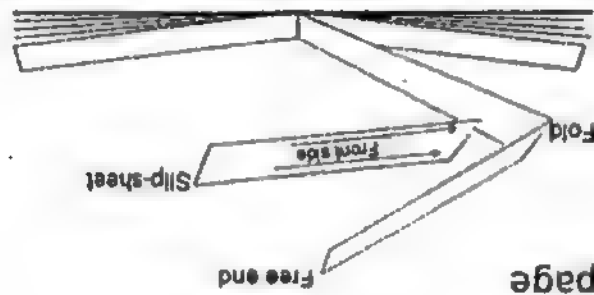
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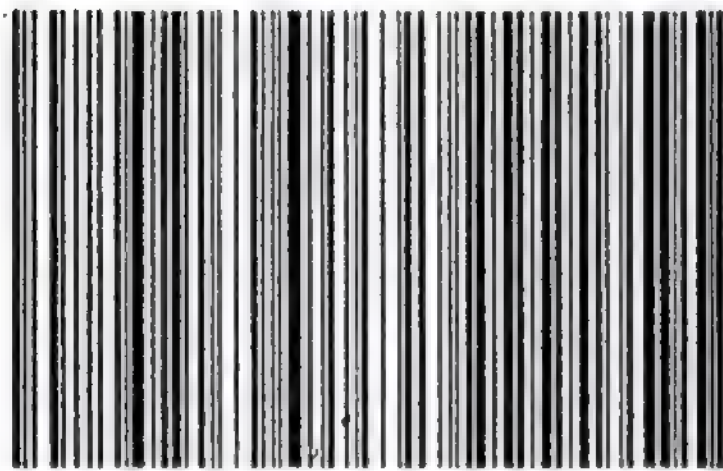
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Inverted Back



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Back

1. Follow instructions on the other side

ZEOS NOTEBOOK

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As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but four times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

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In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

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Reason #8

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In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

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First Looks

Desktop TV: Ready for Prime Time?

HANDS ON
by Steve Rosenthal

If you can't stand being more than a hotkey away from what's on TV, here's a board for you. Desktop TV, a \$399 board from Aview Technology, lets you switch your EGA or VGA monitor between normal computer output and any NTSC video signal. The full-size board includes a TV tuner, audio jack, and the interface chips to connect the tuner to the bus.

If you're looking for special effects, look elsewhere. Desktop TV simply puts the video image in a full screen, completely replacing the normal display. Audio output, which plays badly through an external 2-inch-high boom-box speaker bundled with the board, or plays well through any standard external audio system, continues unabated whether you're in computer or video display mode.

The image is good considering the amount of electrical noise emitted by most PCs. Even with only a modest antenna, the Hitachi tuner module is a decent television on all but the lowest-numbered channels. If you want flawless broadcast reception, you'll need a cable service or a well-shielded coax lead-in from a good antenna.

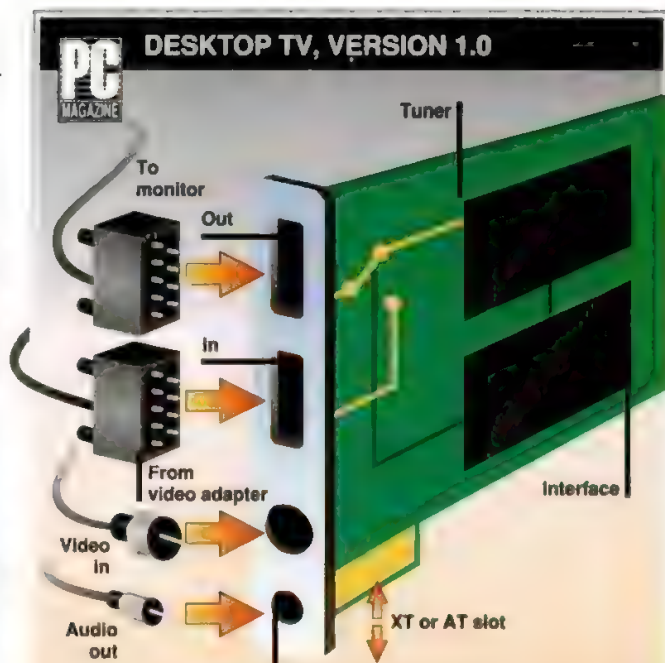
Since you're seeing the image on your normal monitor, it helps to have good display hardware. Even with the best VGA color monitors, you may notice some slight differences in color because the color temperature (color balance) of computer monitors is often somewhat different than that of video models. The current Desktop TV runs at the same 15-kHz horizontal frequency as normal TV, but Aview Technology promises a model that will run at VGA-like 30-kHz rates, therefore displaying a smoother-than-standard TV image.

Software provided with the board creates an on-screen con-

trol panel where you can set normal TV functions such as channel, volume, brightness, and color. Both DOS and Windows versions are included; the DOS version can run either as a TSR or as an application.

The only problems we encountered were with the TSR software, which wasn't compatible with all applications. Aview is working on fixing the problems. Also, the DOS version control panel does not show up over graphics-mode screens, yet the controls still work as if the control panel were visible. More important, Aview doesn't provide an API that would allow training or multimedia programs to switch to TV mode under script control.

For some, an extra \$399 to turn a \$4,000 computer into a TV tuner might be considered



technological overkill; for others it might be a bargain. If you need a TV on your desk but have no space for one more CRT, here's a way to manage.

List Price: Desktop TV, 1.0,

\$399. Requires: Video source or antenna. Aview Technology Inc., 2401 North Forest Rd., P.O. Box 50, Buffalo, NY 14226; 800-866-7288.

CIRCLE 434 ON READER SERVICE CARD

Gain Control Over COM3 and 4 With COMM+232

HANDS ON
by Joe Salem

Configuring a PC for serial communications can be an arcane science; add Windows 3.0 and comm ports above COM2 to the mix, and it becomes difficult to get everything working properly. This is due to the lack of a standard configuration for COM3 (and higher) on an ISA-based PC, as well as Windows' poor support for serial communications.

Sealevel Systems has released a version of their dual-port serial card with software designed for Windows 3.0. The COMM+232 Dual Serial Card is a half-size 8-bit card with two DB-9 serial ports. Two sets of DIP switches control the I/O address of the ports, which can be set for COM1 through COM4. Two jumpers control the interrupt settings for the ports; two other jumpers determine if the same IRQ can be used by more

than one port on a mutually exclusive basis.

Normally the system BIOS and DOS determine how many serial ports a PC will recognize; Sealevel includes a disk of utilities that control the ports on its board, and add support for the additional comm ports to systems that otherwise don't recognize them. Also included is a utility that enables Windows to recognize COM3 and 4. This utility inserts the I/O address of these comm ports into the system BIOS table.

Under plain DOS, the COMM+232 board works fine with communications programs that support more than two ports. But getting Windows to work well with the higher comm ports involves extensive editing of the Windows' SYSTEM.INI file. Installing the card could take a lot of trial-and-error testing. Even after everything is set up properly, you could still encounter random problems using

the card under Windows. For example, your serial mouse may not respond to any input while your communications program is using one of the COMM+232's serial ports, even though the mouse is on a different IRQ. Sealevel's technical support staff is knowledgeable, which is a plus, as you'll most likely have to call them to get everything working.

The manual provides the details to set the switches and jumpers, but it assumes the user has a high level of knowledge about serial communications.

If you have an immediate need for more than two comm ports in your Windows system, COMM+232 is a good choice. Microsoft is aware of problems with serial support; a future version may help. Sealevel will do what it can until then to get you up and running.

List Price: COMM+232 Dual Serial Card, \$169. **Requires:** DOS 3.1 or later. Sealevel Systems Inc., P.O. Box 1808, Easley, SC 29641; 803-855-1581.

CIRCLE 432 ON READER SERVICE CARD

First Looks

\$695 Maple V Addresses Graphics and Interface

HANDS ON
by Barry Simon

On the strength of its symbolic algorithms and speed, Waterloo Maple Software's \$695 *Maple V* won an Editors' Choice in our last roundup of symbolic math programs ("The New World of Higher Math," May 29, 1990). At the time, we noted that its interface was weak and its graphics were limited. *Maple V* addresses these deficiencies and also improves upon the kernel of the program.

The kernel still has the features that make this genre of program so wondrous: exact integer and rational calculations, calculations with arbitrary precision reals, and computer algebra and calculus. In addition, *Maple* has added the Airy and Reimann zeta functions to its large number of functions. There are 12 new built-in packages of procedures including ones for Boolean algebra, tensor calculus, and three-dimensional geometry. Algorithmic improvements include faster calculations of polynomial GCDs and root finding over finite fields.

The real news is the program's enhanced graphics and improved interface. In previous versions, results of large calculations scrolled off the screen and were lost. Now *Maple* remembers the last 1,000 lines of output. A file editor, which can be called from within *Maple*, lets you edit expressions, procedures, or external files. You can also easily reconfigure the menu to call whatever set of functions you use most, and menu items can request user input.

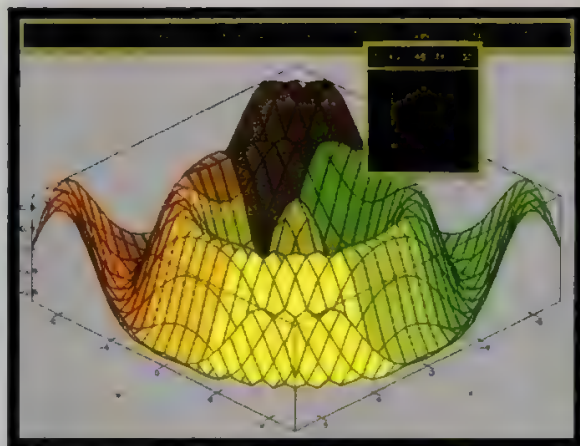
Previous versions of *Maple* only support 2-D graphs. The new 3-D graphics module supports surfaces and wireframes, not contours. A menu interface lets you easily add titles and axes, as well as change colors and view angles.

As with the previous ver-

sion, the new one requires a 386-based system and a math coprocessor. The library of external functions, not in the kernel, is now in one large file, rather than over 2,500 small ones. This translates to more economical use of storage. My total disk space used shrunk from 11MB to less than 7MB.

Finally, improved printer support includes everything from PostScript devices and LaserJets down to 9-pin Epson printers. The program works with *QEMM* and *386MAX*, but will not run in a DOS window under *Microsoft Windows*.

Looming on the horizon as *Maple*'s fiercest competition, is *Mathematica 2.0* from Wolfram Research. *Mathematica* will include a *Windows* version with the same notebook interface that



Maple's 3-D graphics allow you to interactively change viewing angles.

was previously only available on Macs and NeXT machines.

Maple V is a substantial upgrade. First-time shoppers looking for mathematical software will also want to consider *Mathematica*, but they will not be disappointed by *Maple V*. ■
List Price: *Maple V*, \$695, free upgrade for registered users.

Requires: 80386- or 80486-based PC with 80387 or Weitek coprocessor, at least 2MB RAM (3MB or more recommended), 7.5MB hard disk space, DOS 3.3 or later. Waterloo Maple Software, 160 Columbia St., W. Waterloo, Ontario, Canada N2L 3L3; 519-747-2373.

CIRCLE 430 ON READER SERVICE CARD

Power-ON Wakes Up Remote PCs

HANDS ON
by Christopher Barr

In the past, if you wanted to connect your PC to a remote computer via a modem, you had to leave the remote system running, ready to accept the incoming call. Not any longer. *Power-ON* is a telephone-activated power supply that allows a modem call to a remote site to turn on a four-outlet AC power supply, which in turn powers up your computer, loads the bundled communications software, and makes a connection between both PCs. This is not a modem line director, though, so your computer and peripherals require a dedicated phone line.

In addition to its four outlets, the *Power-ON* unit has two RJ-11C telephone jacks—one you connect to the line and the other to the modem. The unit measures approximately 2 by 6.5 by 4.25 inches. A master on/off rocker switch allows *Power-ON* to act as a normal power control unit when set to the on position;

when set to the off position, it waits for telephone activation. As long as the telephone call is active, the power stays on. Eight seconds after the carrier is dropped, the power shuts off and the PC is powered down. As an added bonus, *Power-ON* has standard surge suppression for all four outlets.

The unit is bundled with *EasyLAN/Power-ON* communications software. The software is automatically loaded from a batch file during boot-up at the instance that *Power-ON* detects an incoming call. While *EasyLAN/Power-ON* is adequate for most rudimentary tasks, the software has many shortcomings. Some of the 30 executable files are menu-activated, while others are run from the command line; none of the interfaces are very attractive. The *EasyLAN* software allows you to transfer files from one computer to another using a proprietary protocol, and it allows you to run character-based applications on the remote PC, but

none of these operations can be done easily.

Worse still, *EasyLAN/Power-ON*'s installation procedure is primitive—a number of directories are added to your hard disk without warning. Finally, *EasyLAN/Power-ON* is not rated to operate above 9,600 bits per second, and some modem error-control and data compression schemes may not be compatible with its proprietary file-transfer protocol. If you buy *Power-ON*, you should invest in good-quality remote computing software such as DCA's *Remote2* or Softklone's *Takeover*. In our tests, we used DMA's *pcANYWHERE IV* and *Power-ON*; the combination worked flawlessly.

At \$219.95, *Power-ON* is an ingenious device, but a bit pricey, especially considering you'll need to spend additional money to get acceptable remote-control software. ■

List Price: *Power-ON*, \$219.95. Server Technology Inc., 2332-A Walsh Ave., Santa Clara, CA 95051; 800-835-1515.

CIRCLE 431 ON READER SERVICE CARD

Quick, name the world's best memory manager:

NETROOM!

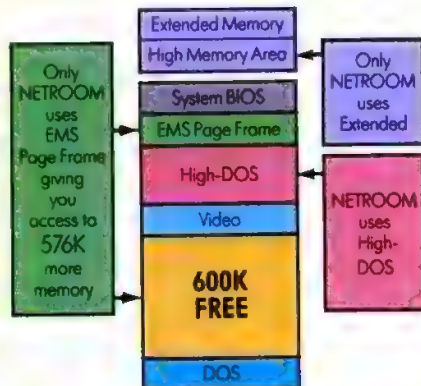


Right!

If you thought the answer is QEMM® or 386MAX®, think again. Because **NETROOM®** just beat them both, by winning PC Magazine's prestigious Editors' Choice award.

PC Magazine said: "With its versatility, this \$149 four-user version rates as a real winner. Considering **NETROOM's** price and capabilities, you will find that there is no second choice."

What makes **NETROOM** a winner is that it is more than a great LAN manager. It is a full-featured memory manager that not only relocates LANs (like Novell, VINES®, etc.), it also moves device drivers, and TSRs into extended, expanded, and high-DOS memory.



Features:	NET-ROOM	QEMM	386 MAX
Windows 3.0 support	✓	✓	✓
Multuser license	✓		
Converts Ext. to Exp.	✓	✓	✓
Relocates to High-DOS	✓	✓	✓
Relocates to LIM 3.2 Frame	✓		
Relocates to Expanded	✓		
Relocates to Extended	✓		
Works on 386/486	✓	✓	✓
Works on 8088/286	✓		
Memory Analysis Utility	✓		

And, **NETROOM** is the only memory manager that runs on all PCs (8088 through 80486).

But, there's more...PC Magazine says it's "The most flexible product we tested,"...and..."**NETROOM** uses a unique swapping feature to access data and programs in extended or expanded memory...Even PCs with tightly jammed high-DOS areas can benefit from the memory swapping capabilities of **NETROOM**."

And to top it all off, with **NETROOM** you will get absolutely **FREE** — **DISCOVER®**, an excellent utility that makes installation a pleasure and provides a detailed, real-time view of the memory configuration and



possibilities within a PC.

PC Magazine says "Netroom's \$149 price for four users is a steal." So, go out and steal yourself a copy!

Available from Helix or at your local dealer.

Requirements: A 386, or some EMS 3.2 or EMS 4.0 memory hardware, or at least 64K ext. memory and DOS 3.3 or greater

1-800-451-0551

*Single User, 4 User \$149, 10 User \$249 plus \$5 per order shipping & handling

HELIX SOFTWARE COMPANY

83-65 Daniels St. Briarwood, NY 11435 (718) 262-8787



StarServer™ E Symmetric Multiprocessor System

ntero

They work with the systems you already own, and they do so in a very big way. They are the AT&T StarServer™ E and new StarServer S, and they're helping us rewrite the rules of client/server computing.

Rule 1: Connectivity. Like all AT&T computers, the StarServers are designed to open systems standards. They support an alphabet soup of networking protocols, including TCP/IP, SNA, OSI, and others, and run Banyan VINES®, Novell® NetWare®, and

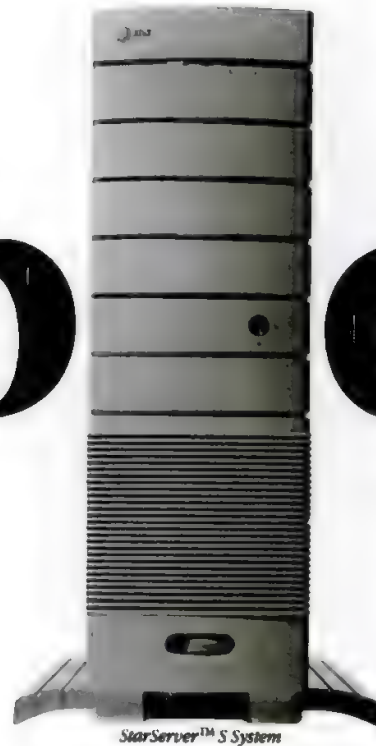
UNIX® System V superbly. No matter what language (or languages) your systems and networks speak, the StarServers can communicate with them fluently.

Rule 2: Control. The StarServers provide file, communications, and print services to DOS and OS/2® PCs, UNIX workstations and terminals, and even Apple® Macintosh® systems, when paired with our award-winning AT&T StarGROUP™ LAN Manager software. Together, they give you complete application freedom at every desk-

top, and let you manage your network from a single administration point.

Rule 3: Value. As the chart at right reveals, the StarServers command the high ground north and south of the Compaq® SystemPro®. For a little more than the price of a SystemPro, the StarServer E boasts a dramatic edge in throughput and flexibility with its lightning-fast system bus, four 486/33 microprocessor bays, and enough storage capacity to last a lifetime. The StarServer S delivers roughly the

perable.



StarServer™ S System

same power as Compaq's top model for far less money. And every StarServer is backed by our vast staff of network computing experts (including Bell Labs designers and software engineers), our team of AT&T Authorized Resellers, our toll-free service hotline, and our unconditional satisfaction guarantee.

For an AT&T Bell Laboratories White Paper on StarServer performance, call us at 1 800 247-1212, Ext. 875 E (in Canada, 1 800 387-6100, Op. 15), or contact your

System Features	AT&T StarServer S Model 3723-302	Compaq System Pro Model 400-420	AT&T StarServer S Model 3726-301
Processor Type	33 MHz Intel® 80486	33 MHz Intel® 80486	33 MHz Intel® 80486
CPU's (Standard/Max)	1/1	1/2	1/4
RAM (Standard/Max)	4 MB/64 MB	8 MB/256 MB	8 MB/512 MB
RAM Cache	128 KB	512 KB	256 KB per CPU
System Bus Speed	33 MB/sec.	66 MB/sec.	267 MB/sec.
Int'l Storage (Std/Max)	300 MB/2.3 GB	420 MB/1.68 GB	300 MB/2.3 GB
Overall Storage (Max)	35 GB	19.98 GB	48 GB
Expansion Slots	10	11	12
Sold Through	Direct, Dealers	Dealers Only	Direct, Dealers
Manufacturer's Support Options	From 8-5 Weekdays To 24 Hrs, 7 days/week	From 7-7 Weekdays only	From 8-5 Weekdays To 24 Hrs, 7 days/week
Price	\$14,995	\$21,999	\$27,500

network computing specialist: your AT&T Authorized Reseller or AT&T Data Sales Executive.

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Add HP NewWave to Windows and what do you get? Simply a breakthrough.



Windows 3.0 is a great step forward. It just doesn't go far enough. You still have to overcome barriers you thought you'd left behind. Such as DOS. The complexities of file management and application integration. And working in two environments.

The solution? Simply add HP NewWave. In this one simple step, you turn your PC into the most powerful, easiest-to-use information tool in business. To prove it, we've put an eye-opening, interactive demonstration on disk.

It shows how NewWave's simple object model lets you work on one

desktop environment, instead of having to use both the Program and File Managers. You don't have to understand the DOS file system at all. And it works with the Windows applications you already have.

Integrating NewWave applications is astoundingly simple. Just drag and drop. "Drill down" editing lets you make changes in part of a document, such as a chart, without leaving it. And with "hot links," your data changes automatically in all connected files.

To evaluate NewWave, call (408) 376-2727 for your interactive demonstration disk. (Handling charge \$3.95.) Then experience one of the most dramatic breakthroughs ever brought to your screen.



**HEWLETT
PACKARD**

by
Cristina Córdova
and Nate Zelnick

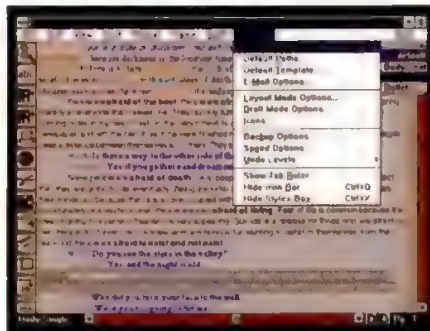
New & Improved

News of Announced Products and Upgrades

Professional Write Plus Fills the Windows Word Processing Gap

NEW *Word for Windows* and *Windows Write* occupy opposing ends of the *Windows*-based word processing spectrum. Looking to bridge that gap is *Professional Write Plus* from **Software Publishing Corp.** The \$249 package includes an integrated e-mail front end that is simple to use and compatible with electronic mail systems based on MHS (Message Handling System).

Other features include an integrated grammar-checker, spell-checker, and thesaurus. Frames, defined as screen areas for text and graphics, make it easy to pour words and pictures into a document. The frames allow users to import and manipulate graphics and text. Text within a frame can be assigned different formatting attributes; text surrounding a frame is automatically reformatted to wrap around the imported text or graphic. A ribbon bar and an icon bar make formatting painless. You can also assign multiple style options in a single screen.



Professional Write Plus's e-mail front end allows you to send or receive a portion of a working document by highlighting it.

The program supports a variety of import/export formats for text, data, and graphics and takes advantage of DDE links.

List Price: *Professional Write Plus*, \$249.

Requires: 1MB RAM, 3.5MB hard disk space, *Microsoft Windows 3.0*. **Software Publishing Corp.**, 1901 Landings Dr., P.O. Box 7210, Mountain View, CA 94039-7210; 415-962-8910.

CIRCLE 437 ON READER SERVICE CARD

The Right Tools Help You Do the "Write" Job

NEW If you're looking for a low-cost way to enhance your writing, *The Complete Writer's Toolkit* from **Systems Compatibility Corp.** and *Editor* from the **Academic Software Library** may help.

The Complete Writer's Toolkit integrates five "writer's reference" tools and a comprehensive grammar and style checker into an easy-to-use application. The \$129 package contains a dictionary of word definitions, a dictionary of quotations, *Roger's II Electronic Thesaurus*, an abbreviation program, and a grammar and style reference guide. You can pop up each tool from your word processor; then make changes directly into your text.

Priced at \$45, *Editor* helps writers eliminate problems such as wordiness, poor word usage, punctuation errors, and inappropriate gender-based language. The menu-driven software does not allow immediate on-screen corrections. Instead, writers repair and improve their texts by using *Editor's* neatly formatted printouts. Users can modify the usage dictionary or create additional dictionaries.

List Price: *The Complete Writer's Toolkit*, \$129. **Requires:** 512K RAM, 5MB hard disk space (to install all tools), DOS 2.x. **Systems Compatibility Corp.**, 401 N. Wabash, #600, Chicago, IL 60611; 800-333-1395, 312-329-0700.

CIRCLE 438 ON READER SERVICE CARD

List Price: *Editor*, \$45. **Requires:** 256K RAM, DOS 2.0 or later. **Academic Software Library**, P.O. Box 8202, North Carolina State University, Raleigh, NC 27695-8202; 800-955-8275.

CIRCLE 439 ON READER SERVICE CARD

HOT PROSPECT

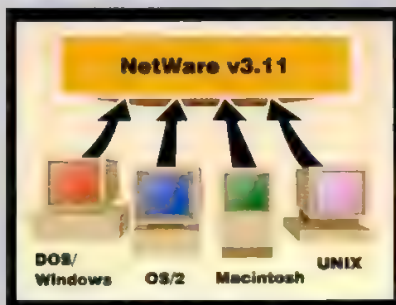
NETWARE 3.11: MULTIDESKTOP SUPPORT THROUGH SEAMLESS INTEGRATION

NetWare, Version 3.11, Novell's network operating system, takes interoperability to new heights. The new version is based on Novell's Integrated Computing Architecture (NICA), which is designed to provide integration of heterogeneous desktops and other computing environments. By integrating these environments, *NetWare* 3.11 allows DOS, *Microsoft Windows*, OS/2, Macintosh, and Unix users to transparently share information and resources.

Novell is packaging Version 3.11 with enhanced internetworking facilities such as support of TCP/IP, the de facto standard protocol for multivendor internetworking. *NetWare* 3.11 also offers interconnectivity through Open Systems Interconnection (OSI). Integrated support for *NetView*, Novell's diagnostics program for servers, allows network managers to monitor a *NetWare* server from a *NetView* management console workstation. Enhanced backup and restore options support all desktops and more than 50 third-party hardware backup devices.

List Price: *NetWare*, Version 3.11, 20-user version, \$3,495; 100-user version, \$6,995; 250-user version, \$12,495. **Novell Inc.**, 122 East 1700 South, Provo, UT 84606; 800-526-5463, 801-429-5900, 408-434-2300.

CIRCLE 436 ON READER SERVICE CARD



NetWare 3.11 offers interoperability between platforms and environments.

New IBM Printer

NEW IBM's Proprinter 24P, priced at \$499, promises to be a low-cost impact printer that's easy to use. The narrow-carriage 24-pin dot matrix printer is designed for letter-quality text and high-resolution graphics.

Like the Proprinter 24E it replaces, the 24P features a full PC-resident set of 252 characters, and graphics resolution of 180 by 360 dots per inch (dpi). However, the Proprinter 24P contains seven resident fonts—three more than the 24E—which are available in all pitches,

CONTINUES ON PAGE 56

BRIEFS

**1-2-3 ADD-ONS**

Insight Resource's KO-PILOT is made for Lotus

1-2-3, Release 2.2. This \$89.95 package offers on-line guidance through every 1-2-3 feature. Using the LearnKwik technology, it teaches the 1-2-3 keystrokes as you're working. 914-332-1589.

AmpliTech's new \$59.95 macro software package, *Macro Magic! For Lotus 1-2-3*, provides a menu-driven macro management system that automates the handling of Lotus 1-2-3 macros, as well as a collection of macro programs and ready-to-build macro libraries. 214-231-8149.

**LAPTOP PERIPHERALS**

Everex is shipping a fax/data modem designed for portable PCs. The Carrier 24/96

combines a 2,400-bps data modem with a 9,600-bps fax modem. For \$499, it supports MNP error correction and data compression for data transfer rates as high as 4,800 bps. 415-498-1111.

Macronix recently introduced a fax/modem for the Compaq LTE. With a retail price of \$599, the MaxFax 9624LT-C features a full send-and-receive 9,600-bps fax and a 2,400-bps modem with MNP data compression and error correction. It also provides an auto-direct function that determines whether a call is for the fax or for the modem. 800-468-4629, 408-453-8088.

Megahertz has released the EasyTalk TX324 2,400-bps modem (\$199) and a 1MB memory upgrade (\$389) for the Texas Instruments TravelMate and Sharp 6220 notebook PC. 800-527-8677.

AMKLY Systems' AMPac-SLT memory expansion boards provide up to 12MB of additional memory for the Compaq SLT 386s/20. The boards come in 1MB (\$495), 2MB (\$895), and 4MB (\$1,495) SIMMs. Users may add up to 12MB of memory with three 4MB AMKLY boards. 714-727-0788.

Generation has created the Parallel Keyboard 101 for portable PC users who want to use a standard keyboard via the parallel port. 714-833-3355.

ranging from 10 to 24 points. You can choose fonts and change the pitch by pushing the operator panel's clearly marked buttons. The printer features up to 192 cps in draft mode and 64 cps in letter-quality mode.

The Proprinter 24P now uses a flat belt instead of wheels for loading paper. IBM offers two paper feed options—a 100-page cut-sheet feeder for \$199 or a pull tractor for \$69. It also comes with a two-step paper park.

In addition, IBM's new printer comes with a 32K print buffer and uses only a parallel interface.

List Price: Proprinter 24P, \$499. **Requires:** Centronics parallel interface cable. IBM Corp., U.S. Marketing and Services, Dept. ZW1, 1133 Westchester Ave., White Plains, NY 10604; 800-426-2468.

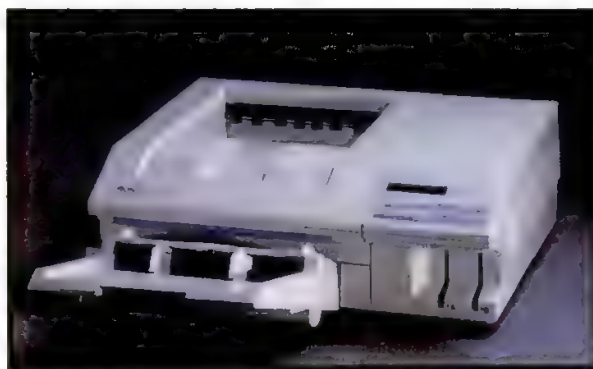
CIRCLE 440 ON READER SERVICE CARD

Epson Bundles Laser Printers with 65 Fonts

NEW The Epson EPL-7000 is a personal laser printer that provides speed and flexible upgrading options. Equipped with an engine speed of six pages per minute, the \$1,399 printer is fully compatible with the HP LaserJet IIP and includes 14 resident fonts and a cartridge for 65 additional fonts. Two card slots facilitate HPGL plotter emulations and other popular printer languages. The EPL-7000 comes standard with 512K of RAM. Although the standard board only holds up to 2MB, the EPL-7000 accepts up to 6MB, with an additional memory board, for graphics or optional emulations.

The \$3,299 EPL-7500 is an Adobe PostScript laser with 35 resident fonts and 2MB RAM standard memory, expandable to 6MB. It features a Weitek XL-8200 RISC processor. Furthermore, the EPL-7000 can be upgraded to the EPL-7500 by replacing the controller. **List Price:** EPL-7000, \$1,399; EPL-7500, \$3,299. Epson America Inc., 20770 Madrona Ave., Torrance, CA 90509-2842; 800-289-3776, 213-782-0770.

CIRCLE 441 ON READER SERVICE CARD



Epson's EPL-7500 is a high-performance laser printer with RISC processing and Adobe PostScript.

LaserJet Font Options: Both Hard and Soft

NEW Are you looking for ways to expand your LaserJet font options? Here are two new products, a hardware option and a software option, to assist you—**Bitstream's** Type City cartridges and **Weaver Graphics' LJ Fonts**.

Bitstream's first font-cartridge product, Type City, is an open-ended expandable font cartridge system that works with the LaserJet Series II family, as well as compatible printers. The \$379 Type City system includes a super cartridge featuring 35 typefaces. Low-cost Type City add-on cards provide additional type faces, logos, and symbols.

LJ Fonts is a \$29.99 library of soft-font disks for the HP LaserJet Plus, LaserJet 500 Plus, Series II family, and compatible printers. Each disk includes 32 fonts—16 in portrait orientation and 16 in landscape orientation. **List Price:** Type City, \$379. Bitstream Inc., 215 First St., Cambridge, MA 02142; 800-522-3668, 617-497-6222.

CIRCLE 442 ON READER SERVICE CARD

List Price: LJ Fonts, \$29.99 (plus shipping). Weaver Graphics, 5165 S. Hwy. A1A, Melbourne Beach, FL 32951; 407-728-4000.

CIRCLE 443 ON READER SERVICE CARD

386/20 Laptop Sports Expansion Chassis

NEW Fora's LP-386C provides users with a 20-MHz 80386 portable system with optional capacity for three AT-bus expansion cards.

For \$4,995, the 14-pound portable comes standard with 2MB of RAM (expandable to 8MB), a 3.5-inch 40MB or 120MB hard disk, and a 1.44MB floppy disk drive. The LP-386C comes with a parallel and a serial port, a proprietary modem slot, and ports for an external VGA monitor, keyboard, and 5.25-inch 1.2MB floppy disk drive. The 2-hour battery recharges in 4 hours.

The \$899 expansion chassis holds two full-length 16-bit cards and one half-length 8-bit expansion card. The LP-386C slides into the chassis for work on the desktop. The chassis is also available for Fora's LP286C.

List Price: LP-386C, 40MB, \$3,995; 120MB, \$4,995; expansion chassis, \$899. Fora Inc., 3081 N. First St., San Jose, CA 95134; 800-367-3672, 408-944-0393.

CIRCLE 444 ON READER SERVICE CARD

EVIDENCE

REPORT CARD			INFO
SPREADSHEET SOFTWARE			WORLD
Quattro Pro			VERSION 2.0
Criterion	(Weighting)	Score	
Performance			
Formulas/analysis	(100)	Very Good	
Compatibility	(50)	Excellent	
Speed	(75)	Very Good	
Database			
Graphics	(75)	Excellent	
Output	(50)	Good	
Macros			
Consolidation/linking	(50)	Excellent	
Capacity	(50)	Excellent	
Documentation			
Ease of learning	(75)	Excellent	
Ease of use	(50)	Excellent	
Error handling			
Support	(100)	Very Good	
Support policies	(25)	Satisfactory	
Technical support	(25)	Satisfactory	
Value	(100)	Excellent	
Final score			8.7

SPREADSHEET SOFTWARE			Lotus 1-2-3
			VERSION 3.1
Criterion	(Weighting)	Score	
Performance			
Formulas/analysis	(100)	Good	
Compatibility	(50)	Excellent	
Speed	(75)	Good	
Database			
Graphics	(75)	Very Good	
Output	(50)	Very Good	
Macros			
Consolidation/linking	(50)	Good	
Capacity	(50)	Good	
Documentation			
Ease of learning	(75)	Excellent	
Ease of use	(50)	Poor	
Error handling			
Support	(100)	Satisfactory	
Support policies	(25)	Very Good	
Technical support	(25)	Satisfactory	
Value	(100)	Satisfactory	
Final score			6.7

Borland's Quattro Pro is the best spreadsheet.

Quattro® Pro 2.0

"Quattro® Pro provides more features and better performance than 1-2-3..."

BYTE, November 1990

"Quattro Pro offers some of the most powerful charting and best-quality output you'll see in a spreadsheet today."

PC Magazine, December 1990

"Overall, Quattro Pro has the best set of database features we've seen in a spreadsheet."

InfoWorld, December 1990

"Quattro Pro 2.0 also offers more interactive presentations, a more flexible desktop environment and smaller RAM requirements."

PC Week, October 1990

Lotus® 1-2-3® r 3.1

"... only masochists need to try [1-2-3, Rel. 3.1 on a 1Mb machine]. Performance was so sluggish on a 1Mb Compaq 386+/20 that we gave up after half an hour."

InfoWorld, October 1990

"... it [Lotus 1-2-3 Release 3.1] doesn't have everything you expect from a graphical interface..."

PC World, September 1990

"...(1-2-3's) WYSIWYG module has little knowledge of what is going on in the primary program..."

PC Week, October 1990

"While the division of labor is mostly logical, it makes [Lotus 1-2-3's] system feel like exactly what it is: a patchwork."

PC Magazine, December 1990

Lotus users! Save \$395 off Quattro Pro 2.0! If you own Lotus 1-2-3, you can upgrade to Quattro Pro 2.0 for only \$99⁹⁵! This includes our 60-day, money-back guarantee.

Order today! See your dealer or CALL NOW 1-800-331-0877

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B O R L A N D

Makers of Paradox®, Quattro® Pro, Turbo C++, Turbo Pascal® and Sidekick®

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CODE MB45



BRIEFS



PRODUCT R&D has designed a \$299 SCSI host-adaptor card, the SCSE, which enables computers with Toshiba's proprietary card slot to drive up to seven peripherals. R&D also introduced a \$199 serial interface card for the dedicated modem slot of the Toshiba notebooks. 800-321-9713, 805-546-9713.



486-BASED PCS
Positive Corp.'s 25-MHz 486, priced under \$3,000, comes with 2MB of RAM, a 128K cache, a 106MB hard disk, a 3.5- and 5.25-inch floppy disk drive, a 14-inch VGA color monitor, and a baby chassis with six expansion slots. The bundled software includes *Windows 3.0*. 800-452-6345.

SIA's 486 SF is a small-footprint computer available in both 25-MHz (\$3,495) and 33-MHz (\$4,347) configurations. The base-priced model includes 2MB of RAM, a 64K cache, a 1.2MB floppy disk drive, an IDE controller, one parallel and two serial ports, and an 800-by-600 Super VGA card. 312-440-1275.

Twinhead is using an Adaptec EISA bus-mastering SCSI controller and an EISA VGA adapter for its new Superset 800E series. The 25- and 33-MHz 486-based systems feature eight full-length EISA expansion slots, 4MB of RAM (expandable to 64MB), a 64K cache, a 200MB SCSI hard disk, and Super VGA graphics. 408-945-0808.

TYAN Computers Corp. announced *Voyager*, a 33-MHz 486-based workstation with 8MB of RAM (expandable to 64MB) and a 64-bit data bus. The 3.5-inch hard disk ranges from 210- to 500MB in memory size. Priced at \$9,999, the system includes a 150MB tape backup unit, two 16-bit expansion slots, and a 256K cache. 408-720-1200.

The Network Connection is shipping a new line of Triumph 33-MHz EISA-based 486 workstations and file servers featuring a 390-watt internal UPS. For \$11,430, the system includes 8MB of RAM, a 1GB SCSI hard disk, a 512K cache disk controller, a choice of floppy disk drives, two parallel and two serial ports, and DOS 4.1. 800-327-4853, 404-751-0889.

Two Additional 16-MHz 286-based Notebooks

NEW Add two more names to the growing list of new 16-MHz 80286 notebooks—the **Tandy 2810 HD** and the **GRiD 1720**. Both feature 1MB of memory (expandable to 5MB), a built-in 3.5-inch 20MB hard disk, an internal 1.44MB floppy disk drive, VGA graphics, and an internal battery pack, which takes 2 hours to recharge. They both offer an optional 80C287 coprocessor, complex spreadsheets, and math-intensive applications.

The 6.7-pound Tandy 2810 HD claims a battery life of up to 3.5 hours. A resume mode lets you turn the 2810 HD off and later return to the exact place where you exited the application. The \$2,499 Tandy includes DOS 4.1, *DeskMate 3.5*, a memory manager, one parallel and one serial port, and an internal slot for an optional 2,400-bps modem (\$199).

The GRiD 1720, though higher priced at \$3,495, comes standard with a 2,400-bps modem and offers an optional 60MB hard disk. The 6.9-pound notebook is powered by a 3-hour battery. It includes a manual standby option and a bridge battery, which keeps the computer operational for at least 5 minutes after the regular battery runs low.

List Price: Tandy 2810 HD, \$2,499. Tandy Corp., 700 One Tandy Ctr., Fort Worth, TX 76102; 817-390-3011.

CIRCLE 445 ON READER SERVICE CARD

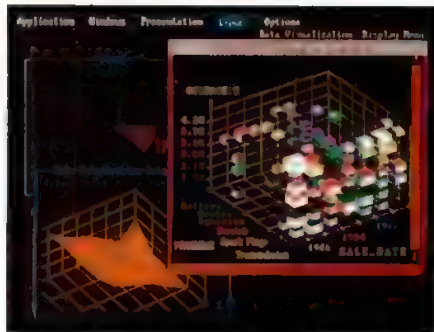
List Price: GRiD 1720, \$3,495. GRiD Systems Corp., 47211 Lakeview Blvd., Fremont, CA 94538; 415-656-4700.

CIRCLE 446 ON READER SERVICE CARD

Visualize Your Database In 2-D and 3-D Graphics

NEW **IntelligenceWare** has designed a tool that automatically displays database files in detailed two- and three-dimensional graphics. *The Database Visualization Tool (DVT)* allows you to manipulate multiple windows to view several graphs simultaneously. It abstracts the shape of the database with numeric as well as nonnumeric data. An internal graphics expert evaluates the data and suggests graphs that best illustrate the database: plots, histograms, pie charts, bar charts, box plots, and surface diagrams.

DVT works in unison with *IXL: The Discovery Machine*, IntelligenceWare's information-discovery system. *IXL* automatically finds hidden patterns, rules, and correlations within large databases. DVT presents the results of *IXL's* analysis in detailed graphics form and also graphs data based on user requirements. No upper limit is imposed on the number of records in the database. The program reads a variety of databases, including *dBASE*, *Oracle*, *Lotus*, and *ASCII* files.



DVT automatically transforms your data into vivid three-dimensional color images.

List Price: *The Database Visualization Tool*, \$490. **Requires:** 640K RAM, DOS 3.0 or later. IntelligenceWare Inc., 5933 W. Century Blvd. #900, Los Angeles, CA 90045; 213-417-8896.

CIRCLE 447 ON READER SERVICE CARD

Low-Cost Entry into Multimedia Animation

NEW Turn an existing presentation graphics package into animation presentation software with **North Coast Software's ANIMaxx**. For only \$33.95, this animation previewer provides frame-flipping animation capabilities under *Microsoft Windows 3.0*. *ANIMaxx* comes with existing animations and allows you to screen your own productions. It includes single-frame stepping, an option to continuously cycle through one or more animations, on-line help, and a print function that supports color or gray-scale printers.

List Price: *ANIMaxx*, \$33.95. **Requires:** *Windows 3.0*. North Coast Software, P.O. Box 343, Barrington, NH 03825; 603-332-9363.

CIRCLE 448 ON READER SERVICE CARD

Magic Fields Adds Power to Windows

NEW Creating data-validation entry screens in *Microsoft Windows 3.0* is now just a matter of pointing and clicking. **Candlelight** and **Blue Sky Software** have joined forces in the creation of *Magic Fields*, an object-orientated data-field validation for *Windows 3.0*.

All of *Magic Fields'* objects can be used with any standard *Windows* dialog editor, such as the ones found in *Microsoft Windows SDK* or *Blue Sky's WindowsMaker Professional*. Objects do not require any coding.

List Price: *Magic Fields*, \$295. **Requires:** *Microsoft Windows 3.0* and *Windows SDK 3.0* or later. Blue Sky Software Corp., 2375 E. Tropicana Ave., #320, Las Vegas, NV 89119; 702-456-6365.

CIRCLE 449 ON READER SERVICE CARD

Full-featured notepad. Lets you check your spelling and even consult an online thesaurus.

Intelligent pager support.

Set your PC to send messages to an alphanumeric pager, no matter where you are.

Reconcile your appointments.

Sidekick identifies and reconciles differences in appointments you have made on your laptop, palmtop or notebook computer with those on your desktop PC.

A complete address list.

It organizes your names, finds your numbers, places your calls, and prints out your telephone lists.

Four calculators in one.

Crunch numbers in four different ways—simple, scientific, financial and programmer.

The ultimate time planner.

Includes a calendar, an appointment list and a To-Do list with prioritizing capabilities. All have professional-quality printouts.

Borland's New Sidekick 2.0 Organize Your Life Forever Or Your Money Back

Sidekick,* the world's most popular organizer, now keeps you organized in an interconnected world where people are constantly on the go. Sidekick's time planner, address book, notepad, calculators and communications have all been redesigned with one thing in mind... organization. And it's all there for you at the touch of a key.

Just check out Sidekick's features: Professional-quality calendar printouts that fit into your favorite appointment books.

The ability to reconcile appointments you have made on other PCs or palmtop organizers.

Total LAN support to coordinate schedules with others in your workgroup. And new 40K RAM-resident memory efficiency.

Limited Time Offer.

Get Sidekick for only \$69⁹⁵!* Organization guaranteed or your money back within 60 days of purchase.

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Makers of Paradox®, Quattro® Pro, Turbo C++, Turbo Pascal® and Sidekick®

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*Offer expires 6/30/91. Suggested retail price is \$99.95. Offer good in U.S. and Canada only. Sidekick is a registered trademark of Borland International, Inc. Copyright © 1991 Borland. BI 1383

CIRCLE 295 ON READER SERVICE CARD

BRIEFS



NETWORKS

Ontrack Computer Systems has released Version 2.0 of *NetUtils* (\$99.95). The hard disk utilities offer multiple file recovery on a downed server, support for drives with more than 1,024 cylinders, and improved SCSI drive support with Novell. 800-752-1333, 617-937-1107.

Proxima's IPS battery backup software, *LANSoft*, now supports Microsoft's *LAN Manager*, 3Com's *3+Open*, IBM *LAN Server*, and SCO Unix System V/386. 800-582-2580, 619-457-5500.

DataEase International's *DataEase SQL Professional*. (\$995; network edition: \$1,995; workstation five-pack \$1,750) allows communication with non-OS/2-based Sybase *SQL Server* via protocols other than named pipes, including Novell *NetWare SPX*, *TCP/IP*, and *DECnet*. 800-243-5123, 203-374-8000.

Lanmaster has released *Outcomserv* (four users, \$995; eight users, \$1,495; sixteen users, \$2,495) that allows 16 Novell *NetWare* or *NetBIOS* LAN users to dial out simultaneously into a LAN, VAX, BBS, or standalone PC through a four-, eight-, or sixteen-port communications board. 800-441-6189.

Spider Systems now offers its remote diagnostic device, the *SpiderProbe B130-R* (\$3,450), for Token-Ring networks. The device provides graphic and numerical traffic and error statistics, hardware tests, packet capture and seven-layer protocol decoding from one master station. 800-447-7807 or 617-270-3510.



ACCOUNTING

M-USA Business Systems has released *Pacioli Payroll*, a free extension (\$7.50 shipping and handling) to its double-entry accounting program, *Pacioli 2000*. The module also runs as a standalone automated-payroll package. 800-421-5355.

Solomon Software has also announced an enhanced payroll module, the *1990 Payroll/W-2* (free for registered *Solomon III Payroll* users), which complies with changes to 1990 W-2 and 1099 forms. 800-879-0444.

Microsoft Overhauls Word for OS/2

IMPROVED Microsoft Word for OS/2 fully supports high-performance file system, long filenames, extended file attributes, as well as both single- and dual-direction DDLs. WYSIWYG and graphical editing extend to direct manipulation of objects and hot spots. Integration with other OS/2 applications now exists through the macro language, Word-Basic.

Groupware and document management tasks are simplified with annotation features, revision marking, and support for networks including *OS/2 LAN Server* and *LAN Manager*. Users may insert and scale graphics files .CGM, .PCX, and .PMF graphics file formats.

Word for OS/2 is file compatible with Word for Windows and Word 5.5 for DOS and shares the same command structure.

List Price: Microsoft Word for OS/2, \$495.

Requires: 3MB disk space, OS/2 1.2 or later. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080.

CIRCLE 460 ON READER SERVICE CARD

Fifth Generation Releases Mace Express

IMPROVED The Mace Utilities from Fifth Generation Systems has been redesigned and divided into four task-specific packages. *Mace Format* recovers data lost by accidental disk formatting, *Mace Performance* works against fragmentation of data for optimal disk performance, *Mace Prevention* automizes preventive maintenance, and *Mace Recovery* includes advanced diagnostics and correction utilities. Each package includes mouse support and autorunning programs designed to make disaster recovery less painful.

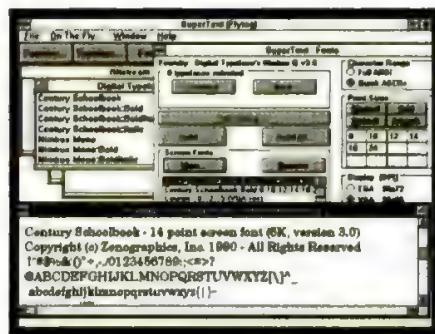
List Price: Mace Express Collection, \$69 each. **Requires:** 256K RAM, DOS 2.0 or later. Fifth Generation Systems, 10049 N. Reiger Rd., Baton Rouge, LA 70809 800-873-4384, 504-291-7221.

CIRCLE 700 ON READER SERVICE CARD

Print Faster than a Speeding Bullet

IMPROVED Zenographic's printing enhancer for Windows now offers on-the-fly scalable fonts for 9- and 24-pin IBM and Epson compatible dot matrix printers at resolutions up to 360 by 360 dots per inch. *SuperPrint*, Version 1.1, also adds support for Bitstream's *FaceLift* typefaces in addition to improved handling of its wide selection of supported fonts.

List Price: SuperPrint 1.1, dot matrix, HP LaserJet, DeskJet, and PaintJet version: \$195; color thermal printer version: \$395;



SuperPrint's SuperText builds outline screen fonts from URW master drawings.

\$50 upgrade. **Requires:** Windows 3.0, supported printer. Zenographics, 4 Executive Circle, #200, Irvine, CA 92714; 714-851-6352.

CIRCLE 701 ON READER SERVICE CARD

Software Bridges Data

IMPROVED System Compatibility Corp.'s spreadsheet- and database-to-word processor conversion utility has added 21 new file formats. *Software Bridge*, which retains the native look and feel of the imported data, now offers support for Novell *NetWare* and 3Com *3+Open LAN Manager* networks. Data may also be converted from PC systems running under DOS and exported to Macintosh word processing formats.

List Price: Software Bridge, Version 5.0, \$149; three-user network version, \$295; \$69 per additional user; upgrade \$49.

Requires: 384K, DOS 2.0 or later. System Compatibility Corp., 401 N. Wabash, #600, Chicago, IL 60611; 800-333-1395.

CIRCLE 702 ON READER SERVICE CARD

Keep Track Attractively

IMPROVED Power Up! Software has enhanced *Address Book Plus* and *Calendar Creator Plus*. Calendar Creator's data management now eliminates the need for reentry of recurring events. .PCX file support lets users customize output or add logos. Other enhancements are a WYSIWYG print preview, two scalable typefaces, and use of expanded memory.

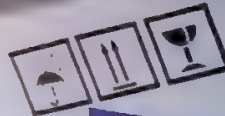
Address Book Plus offers a more-flexible data-entry screen, an autodialer, and designation of up to ten subcategories of information for custom address books. It also adds proportional font scaling for laser printer output. ■

List Price: Calendar Creator Plus, Version 4.0, \$79; Address Book Plus, Version 3.0, \$69. **Requires:** 512K RAM, DOS 2.1 or later. Power Up! Software Corp., 2929 Campus Dr., San Mateo, CA 94403; 415-345-5900.

CIRCLE 703 ON READER SERVICE CARD

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Swan Express



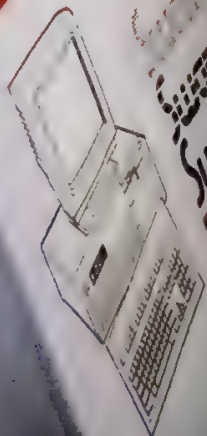
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386

Computers

Swan Computers

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see next
page for details

Swan 486/25

- 4MB of 32-bit RAM, expandable to 16MB
- 8K internal cache, 64K secondary cache
- 100MB IDE hard drive—17ms access
- 1.2MB 5.25" and 1.44MB 3.5" floppy drives

"Swan's 486/25...a great machine at a near mythical price. If someone offers a similar configuration for less, worry about the quality."

—Computer Shopper, 10/90

- DOS 4.01 installed
- Other configurations available

NEW LOWER PRICE!

Complete 100MB Monochrome System

\$3495

Swan 386/33

- Intel 80386DX-33™
- 4MB of 32-bit RAM
- 64K of SRAM cache
- 200MB IDE hard drive
- Dual floppy drives
- Swan high-resolution (1024 x 768) video system
- DOS 4.01 installed

386/33	VIDEO OPTIONS Include Monitor & Video Adapter			
	Drive Options	Mono	14" Flat Mono	VGA Mono 1024 VGA
w/100MB (17ms) IDE		\$2595	\$2645	\$2795
w/200MB (16ms) IDE		\$3095	\$3145	\$3295
w/330MB (16.5ms) SCSI		\$3695	\$3745	\$3895
w/600MB (16.5ms) SCSI		\$4595	\$4645	\$4795

"The Swan 386/33...a strong recommendation as an ideal home or small office machine."

—PC Magazine, 12/25/90

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Complete 200MB VGA Color System

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Swan 386/25C

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Complete 100MB
VGA Color System

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- Intel 80386DX-25™
- 4MB of 32-bit RAM expandable to 16MB
- 64K of SRAM cache
- 100MB IDE hard drive—17ms access

- 1.2MB 5.25" and 1.44MB 3.5" floppy drives
- Swan high-resolution (1024 x 768) video system
- DOS 4.01 installed
- Call for other configurations

Swan 386/25

PRICES REDUCED!

386/25	VIDEO OPTIONS Include Monitor & Video Adapter			
	Drive Options	Mono	14" Flat Mono	VGA Mono 1024 VGA
w/50MB (17ms) IDE			\$1745	\$1895
w/100MB (17ms) IDE		\$1945	\$1995	\$2145
w/200MB (16ms) IDE		\$2445	\$2495	\$2645

"It's faster than other uncached machines I've tested...for the price, Swan's 386/25 offers some of the best performance you can buy."

—PC Sources, 11/90

- 2MB Performance System**
- 2MB RAM, 50MB (17ms) hard drive
 - 1024 color VGA • Dual floppy drives
 - DOS 4.01 and Windows 3.0 installed
 - Swan mouse • Swan mousepad

\$2395*

4MB Power System

- 4MB RAM, 100MB (17ms) hard drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Swan mouse • Swan mousepad

\$2695*

- Intel 80386DX-25™
- Norton SI (v4.5): 26.3
- 1MB of 32-bit RAM expandable to 16MB
- 50MB IDE hard drive—17ms access
- 1.2MB 5.25" or 1.44MB 3.5" floppy drive
- High-resolution (720 x 348) mono video system

Complete 50MB Monochrome System

\$1695

Swan 386SX

PRICES REDUCED!

386SX/16	VIDEO OPTIONS Include Monitor & Video Adapter			
	Drive Options	Mono	14" Flat Mono	VGA Mono 1024 VGA
w/50MB (17ms) IDE			\$1345	\$1495
w/100MB (17ms) IDE		\$1545	\$1595	\$1745
w/200MB (16ms) IDE		\$2045	\$2095	\$2245

"It is well constructed, very expandable and one of the best 386SX performers we've seen...an exceptional value"

—Computer Buyer's Guide & Handbook

Call for details on our 20MHz 386SX!

- 2MB Performance System**
- 2MB RAM, 50MB (17ms) hard drive
 - 1024 color VGA • Dual floppy drives
 - DOS 4.01 and Windows 3.0 installed
 - Swan mouse • Swan mousepad

\$2049*

4MB Power System

- 4MB RAM, 100MB (17ms) hard drive
- 1024 color VGA • Dual floppy drives
- DOS 4.01 and Windows 3.0 installed
- Swan mouse • Swan mousepad

\$2395*

- Intel 80386SX-16™
- Norton SI (v4.5): 17.3
- Novell Labs tested and approved
- 1MB of 16-bit RAM expandable to 8MB
- 50MB IDE hard drive—17 ms access
- 1.2MB 5.25" or 1.44MB 3.5" floppy
- High-resolution (720 x 348) mono video system

Complete 50MB Monochrome System

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Why wait 2 or 3 weeks for your new computer? We will ship it today! Guaranteed. Take your pick from our nine most popular configurations.

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- 286/12 1MB RAM, 40MB drive, VGA video

Orders accepted by 3:00 PM (Eastern time, Monday-Friday) will be shipped the same day.* Overnight delivery available.



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At Swan, service and reliability are top priorities. And it shows. "...these ratings mean that Swan managed to make and keep its customers happier than any other PC manufacturer" said PC Magazine in reporting the results of its service and reliability survey.

Reliability of Swan computers is among the highest in the industry—ensured by:

- the selection of top quality components from industry leaders like Quantum, Intel and Sony.
- extensive compatibility testing in numerous LAN and stand-alone operating environments.
- each system undergoes rigorous testing and burn-in procedures.

"I wave the Swan flag...these people are great when it comes to making things work for the customer."

—Daniel Morgan,
PC Magazine, 9/25/90



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Don't settle for half the coverage. We understand the importance of keeping your computer up and running, not just for the first year, but long after. Field service is provided by TRW, a leader in computer maintenance, with over 200 service centers nationwide.

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NEW LOWER PRICE!

Complete 40MB VGA Color System

\$1495*

- 80286 12/8 MHz Norton SI 11.7
- 1MB of 16-bit RAM expandable to 8MB
- 40MB IDE hard drive with voice coil
- 1.2MB 5.25" floppy drive

- High-resolution VGA video system
- Small footprint case
- Utilities software
- Enhanced 101-key keyboard

configuration...available now!

Swan XT10

Complete 32MB Monochrome System

\$925

- 10/4.77 MHz 8088-1
- 640K RAM
- 32MB hard drive—40ms access
- 360K floppy drive
- High-resolution (720 x 348) mono video system

- 150W Power Supply
- 640K RAM
- Enhanced 101-key keyboard
- Recipient of Computer Shopper's 1990 Best Buy award

Peripherals**Video Cards****New! Swan VGA Palette Plus**

Delivers 32,763 colors from a palette of 16,700,000! With 1MB, the Palette Plus supports resolutions up to 1024 x 768 non-interlaced. Includes drivers for WordPerfect 5.1, AutoCAD, 8514/A, plus HiColor™ drivers for Windows 3.0.

\$249**Swan 1024 VGA Card**

Superior clarity and fantastic colors of non-interlaced 1024 x 768 resolution.

w/ 1MB	\$199
w/ 512K	\$159
w/ 256K	\$129

New! Swan Spectrum VGA

This 16-bit card supports 640 x 480 resolution with 16 colors.

\$69**Modems****Swan 9600 Baud Modem**

Ideal for high-volume, high-speed transmissions. Supports the v.42 standard for error-free communication.

\$429

2400 Bd MNP Int/Ext	\$99/\$129
2400 Bd Int/Ext	\$75/\$99

Tape Backups**New! Swan 700MB Tape Backup**

The preferred choice for fast, cost-effective high-capacity data storage, with data transfer rates of up to 12MB per minute. Features software data compression, Novell compatibility plus expanded memory support. Requires data compression card. Includes two-year warranty.

Int/Ext **\$799/\$999****Swan 250MB Tape Backup**Int/Ext **\$319/\$419****Swan 120MB Tape Backup**Int/Ext **\$249/\$349****New! Swan SendFAX**

Now you can send faxes directly from your PC to any Group III compatible fax machine or PC Fax at 9600bps. The Hayes compatible modem communicates at 2400, 1200, and 300 bps. Features digital signal processing for higher performance, plus BitCom software.

\$109**New! Swan Elite Keyboard**

130 keys with built-in calculator.

\$99**Monitors****Swan VGA 15**

Our professional multiscanning monitor features non-interlaced 1024 x 768 resolution and a 15" anti-glare screen. It accepts both analog and digital input. Other features include .31mm dot pitch, auto screen sizing and tilt/swivel base.

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CIRCLE 268 ON READER SERVICE CARD

edited by
Matthew J. Ross

Read Only

Reviews of the Latest Books for the PC User

Achieving DTP Power

■ *The Manager's Guide to Desktop Electronic Publishing*
by George R. Marshall with Ken Friedman
Prentice Hall, \$24.95

Most people who install a desktop publishing system in a large office make one fatal mistake: They fail to understand how the new technology will change existing job descriptions and staff interactions. *The Manager's Guide to Desktop Electronic Publishing* by George R. Marshall can save you from following in those misdirected footsteps.

Marshall debunks some of the common myths about desktop electronic publishing (DEP). For example, electronic publishing will *not* reduce the amount of paper in your office. The author warns against a



fascination with technology for its own sake, and provides a scoring system to weigh the sophistication of

a feature (such as automatic indexing), against its relative importance to your organization's stated DEP goals.

Due to the production lags involved in book publishing, some of the product-specific material is already out of date. However, in a courageous move, Marshall decided to publish the chapter that deals specifically with *PageMaker's* features using *PageMaker*. The same holds true for the chapters on *Ventura*, *Quark Xpress*, and *Interleaf Publisher*, allowing the author to identify specific applications for which each product is best suited.

Although Marshall neglects

to discuss in detail the problems associated with networked electronic publishing, such as document flow and group access, he clearly demonstrates that a successful DEP system depends upon its supporting infrastructure. This infrastructure consists of cooperative software, such as compatible word processors and graphics programs, as well as cooperative workers, who may require departmental restructuring or new job descriptions. In short, *The Manager's Guide to Desktop Electronic Publishing* is a long overdue look at the real issues of corporate-wide DTP.

—Luisa Simone

Prentice Hall, Englewood Cliffs, NJ
07632; 201-767-5937.
ISBN: 0-13-168584-8

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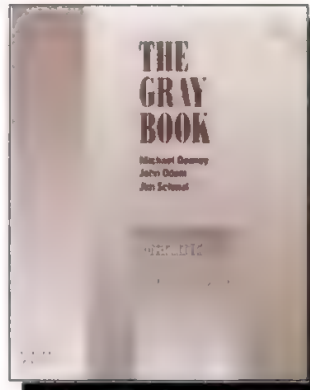
■ *The Gray Book*

by Michael Gosney, John Odam,
and Jim Schmal
Ventana Press, \$22.95

While color printers get lots of attention, most people still print their pages in black and white. As fans of Ansel Adams can tell you, monochrome output need not be a limitation. The authors of *The Gray Book* understand this, and have put together an incredible book on how to pull the best results off your screen and through your laser printer.

Don't buy this book for the text; buy it for the pictures. The bulk of the 200-page book is devoted to sample images, created by professionals working on real projects. These pictures provide an exciting range of possibilities for the use of gray-scale as well as straight black-and-white techniques.

The book is not without its



The Gray Book will help you produce better output from your laser printer.

weak points. The sections on scanning and different output technologies are not clear in places, and some of the book's advice and terminology are open to argument. And while the Macintosh influence is heavy, this is not a problem since the techniques discussed are all available on PCs as well.

So if you're tired of the same old pages and are looking for inspiration on how to make the most out of monochrome print technology, *The Gray Book* is certain to spark creative new approaches to the problems of black and white.—Alfred Poor

Ventana Press, Chapel Hill, NC,
27515; 919-942-0220.
ISBN: 0-940087-50-2

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■ *The Power of Color in Design for Desktop Publishing*

by Vern Groff
MIS: Press, \$24.95
Simply stated, Vern Groff's guide for the preparation, design, and printing of desktop-published work is a generic graphics art production handbook with a DTP twist. The book's real strength lies in

its advice to the electronic publisher on sensible systems and procedures to efficiently produce an effective printed piece.

Groff's writing shows an understanding of the copy preparation, typography, color theory, conventional printing, film work, and color separation necessary for electronically published material.

Regrettably, the information within *The Power of Color in Design* is introductory in nature. The desktop publisher's vital relationship with the service bureau and printer is stressed throughout, but without nitty-gritty detail. In-house color separation is played down without justification, and the integration of desktop-produced color illustration is barely mentioned.

While Groff addresses color as a method to enhance the effectiveness of electronically published material, direction on achieving successful color output from PostScript image setters is nonexistent. Nor is there any mention of the well-documented caveats

concerning color combinations to avoid.

Upfront, *The Power of Color in Design*

assumes that readers know and understand their DTP programs. Those who do need application-specific tips to use and traps to avoid. Groff's overview approach won't satisfy these users' needs.—Greg Pastrick

MIS: Press, Portland, OR 97227;

800-626-8257.
ISBN: 1-55828-050-2

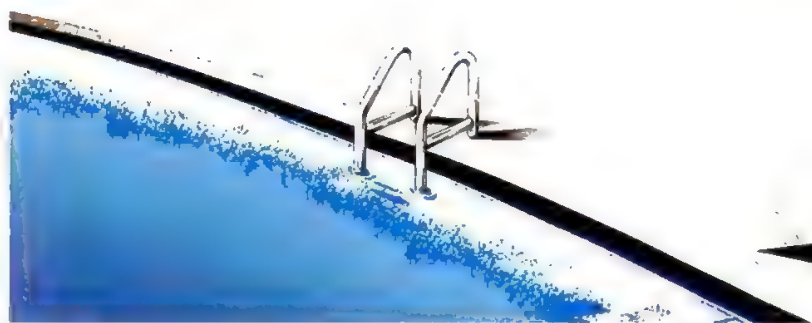
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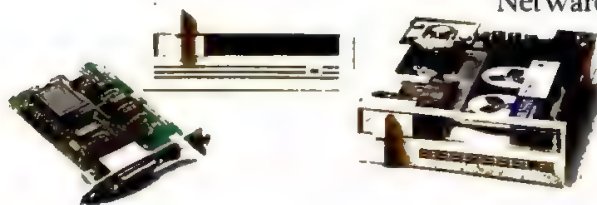
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by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Microsoft Details Its Current Strategy for Improving OS/2, Windows, and DOS

There's been a lot of speculation on Microsoft's systems strategy in recent months. Some of the speculation is a result of Microsoft's revisions of its own plans, and some comes from outright guessing.

One recent report alleged that Microsoft was about to abandon OS/2 completely, in order to promote *Windows* as the only multitasking graphical environment for the PC.

That's far from true.

To help reduce the confusion, Microsoft recently made a detailed statement on its current directions with strategic products, from DOS to OS/2.

You can't take the statement as the definitive word on the product releases that we'll see in coming years because Microsoft may not be able to realize all of its goals and the company may find that the market has changed during the time it takes to create the products.

But anyone buying PC software is better off knowing what Microsoft is *really* saying it will do, rather than listening to analysts who are trying to read between the lines.

Microsoft's current position is little changed since last fall. It has surrendered active develop-

ment work on the 16-bit version of OS/2 to IBM.

IBM has confirmed that it is still devoting considerable amounts of programming resources to improve the performance of OS/2 in both 16-bit and 32-bit versions.

The OS/2 programmers at Microsoft are working on a 32-bit version with the goal of making it portable across hardware. It's expected that this version will run on Intel's 860, IBM's RS-6000, and Sun's SPARC.

Microsoft stated that this version, which is based on completely new code, has already been successfully tested on four different processors.

This strategy corrects a weakness in Microsoft's old plan. Microsoft realizes now that the typical office worker with a 386, working on spreadsheets and small databases, doesn't need OS/2's horsepower.

These people can be satisfied with *Windows*. Microsoft admits that this point was made clear to them only after *Windows* 3.0 began to sell like a house afire; Microsoft said that, in eight months, 2.25 million copies of *Windows* 3.0 have been sold.

(Compare that with OS/2: in

its first four years, less than 200,000 copies have been sold.)

Rather than try to convert these people to OS/2 as their requirements grow, Microsoft believes it can keep them happy with *Windows*. And so it's planning a 32-bit version that will have a kernel capable of preemptive multitasking and multithreading of applications, which eliminates the problem of one program interfering with another.

A clearer idea of how far this will go should be seen at the end of this year when Microsoft ships the developer's toolkit for the 32-bit version.

able file system, to make long filenames a reality and to allow DOS to address CD-ROMs, networks, and other operating systems more directly. At some point, disaster recovery and disk mirroring should be possible from within DOS.

Enhancements to DOS will avoid the kind of API (application programming interface) development that make *Windows* and OS/2 so powerful and that would hurt DOS's greatest strength: compatibility with thousands of programs.

Some of the performance improvements to DOS will make

Revisions to DOS should provide an installable file system, making long filenames a reality and allowing DOS to address networks more directly.

A more modest upgrade, *Windows* 3.1, will be introduced in the middle of 1991 and it will incorporate TrueType fonts, Object Linking and Embedding (OLE), and minor performance enhancements.

Microsoft also confirmed that it will continue to enhance DOS, with a new version due within months (it's now undergoing final testing). This new version will have an editable command line (similar to *PC Magazine's* ALIAS utility) and will install part of itself in high memory.

This version will also represent a significant change in Microsoft's marketing of DOS, since the company will become a full-scale DOS retailer, instead of relying on hardware manufacturers to market DOS.

In later years, revisions to DOS should provide an instal-

integration with *Windows* smoother. Microsoft's goal is to cement *Windows'* current role as a DOS upgrade path.

DOS's continued health hardly needs to be confirmed but, for the record, Microsoft is projecting sales of 18 million copies of DOS in 1991.

That will bring the total number of computers running DOS to roughly 78 million, worldwide.

MHS Development Work Taken Over by Novell

Novell has decided that if there's going to be a consistent e-mail strategy throughout *NetWare*, Novell's going to have to do the work.

The company bought the MHS (message handling service) engine from Action Tech-

CONTINUES ON PAGE 69

HOW MICROSOFT SEES THE OPERATING SYSTEM MARKET

Microsoft has formally conceded that it overestimated the demand for OS/2. It now believes that *Windows* can satisfy much of the demand for a multitasking graphical environment.

Low end	MS-DOS, DR DOS
Midrange	Windows, OS/2, DESQview
High end	OS/2, SunOS, AIX, OSF/1, HP-UX, NetWare

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Pipeline

CONTINUED FROM PAGE 67

nologies in January and has already announced the first revision to MHS.

Novell originally commissioned Action to develop MHS as a store-and-forward mail engine for *NetWare*. MHS's success helped spawn a small industry, where Action was competing with its own MHS front end, *The Coordinator*, against *Da Vinci Mail*, *cc:Mail*, and *Network Courier*.

Action is now free to compete on equal terms with other e-mail software companies, and Novell will try to ensure that MHS grows with *NetWare* and doesn't get in the way.

One indication of this pattern is that, later this year, Novell plans to introduce an NLM that will allow *NetWare* 3.11 to become the MHS server.

Later, Novell plans to incorporate the X.500 protocols directly into *NetWare*.

Committee Calls for March 17 Shareware Payment

An informal group of shareware users has called for a nationwide "shareware settlement day" on March 17.

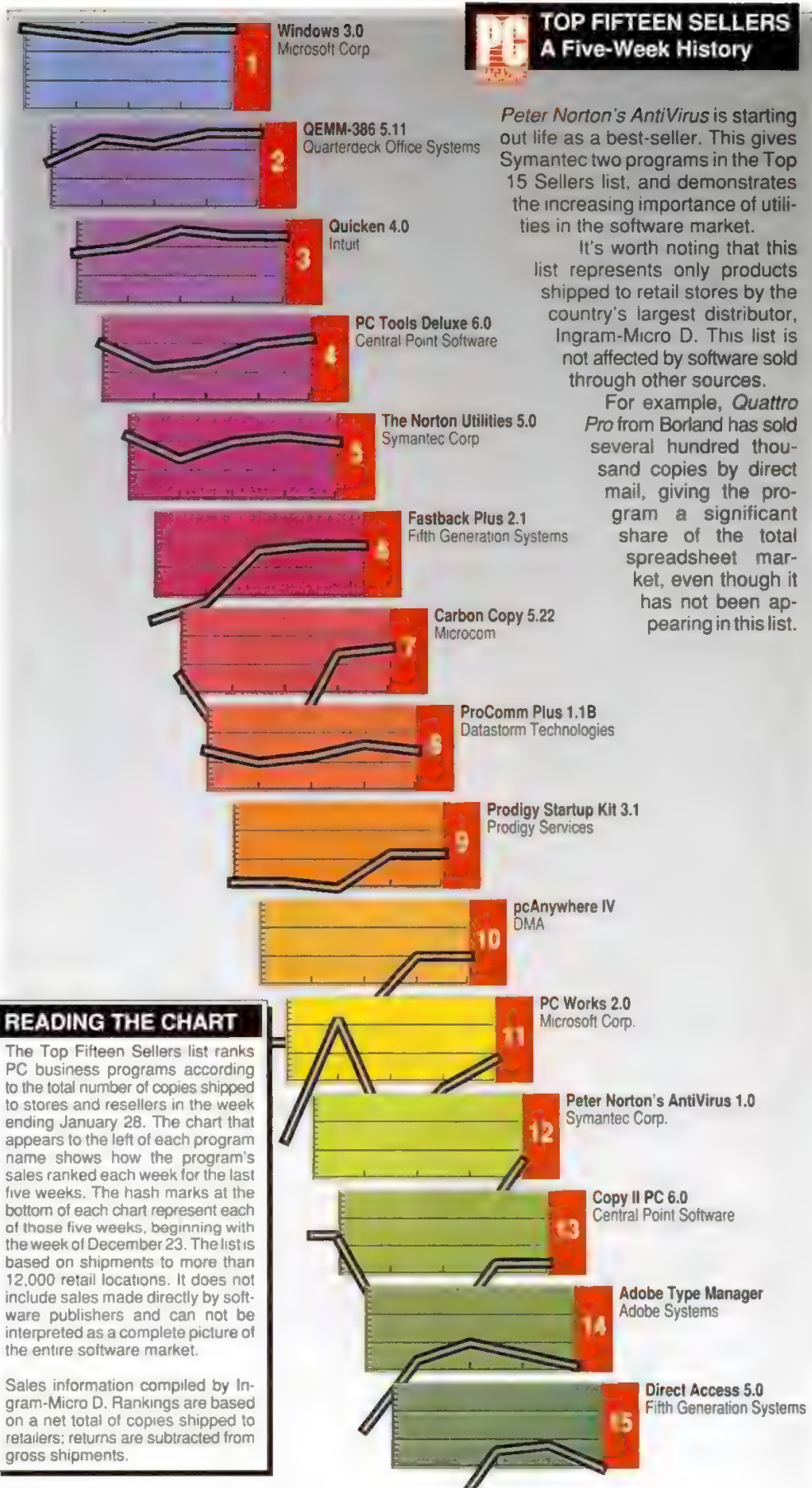
The committee is operating on the assumption that many shareware users have every intention of paying the registration fees but often forget to mail in their check.

Calling itself SPUD (Shareware Pay-Up Day), the committee is recommending that anyone who's using unregistered shareware take stock of their hard disk, and mail in registration fees that have been neglected.

Lotus Acquires cc:Mail, Integration with Notes Unclear

Lotus's recent acquisition of cc:Mail Inc. may help the company bolster its presence in connectivity, an area where Lotus has been unsuccessful in the past.

The natural result of this union should be a growing synergy between *cc:Mail* and *Lotus Notes*. Right now, no one seems to know how—or if—that's going to happen.



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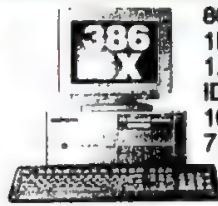
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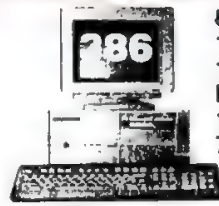
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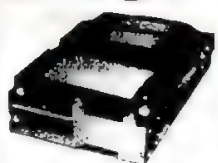
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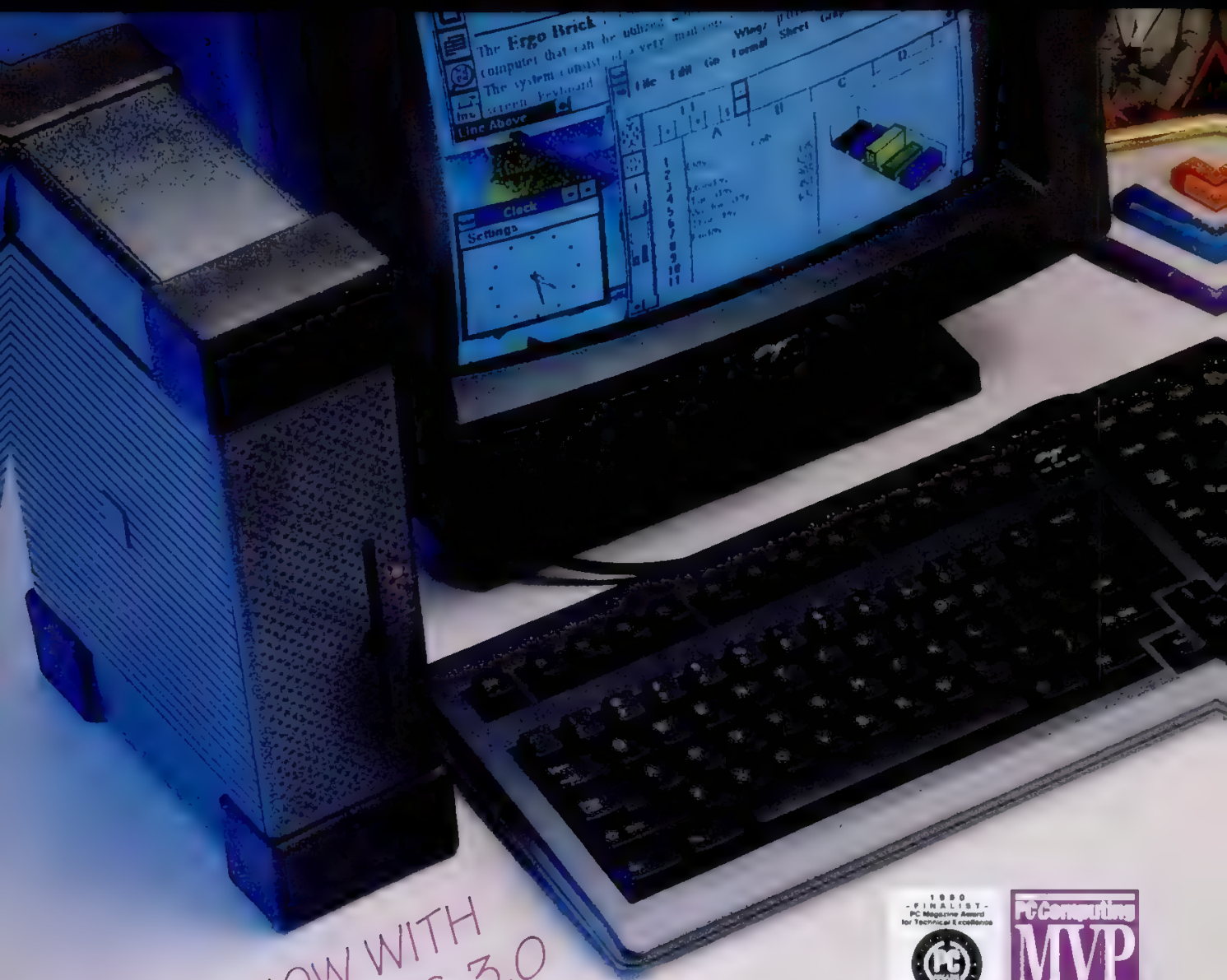
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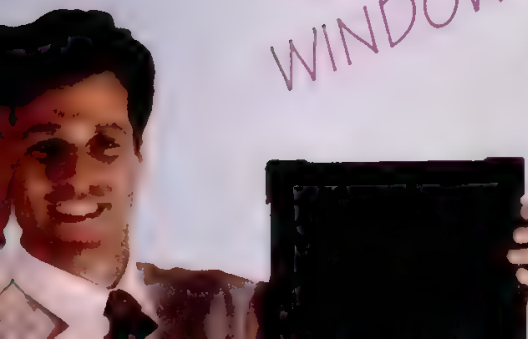
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Bill Machrone



My Last Laptop

Adjusting to a new laptop is easier than getting a new spouse, but not by much.

In the classic Robert Browning poem, "My Last Duchess," the reader is taken on a wry tour through a gallery of paintings of the duke's former wives, all of whom have met unfortunate or untimely ends. The duke sighs, and remembers each fondly, while referring darkly to one tragic flaw or another. I feel the same way about the laptops I've known and loved. Each holds a special place in my heart, yet none has been perfect, and moving from one to the next is not always progress.

I started way back in 1983, with a Radio Shack Model 100, four pounds of simple functionality. Its 8-line screen and 300-bps modem are laughable today, but it ran for 20 hours on a quartet of AA batteries and did the job for me for five years. Of course, it didn't run DOS programs, but it was fine for word processing and telecommunications. One of the best features of the Model 100 was that you could just turn it off at any point—the memory was maintained by a backup battery—and pick up where you left off.

My first DOS-based laptop was an original Toshiba T1100. I took it on vacation and desktop-published a cookbook. And I never used it again. Seven-plus pounds was just too heavy to take on the road every day. I do my work on trains and in airplanes, and DOS compatibility mattered a whole lot less than the weight. I've always been happy with a serial cable to transfer my files back and forth, so the floppy disk was excess baggage. Likewise, the nonbacklit screen was unreadable in all but the most optimal conditions, a malady that afflicts the T1000, as well.

I've always liked Toshiba's autoresume feature, but the weight and size penalty has always been just a little higher than I'd like to pay. So these machines were more like flirtations than marriages.

My next machine was the NEC UltraLite, which became my daily companion for the next two years. Battery life was nothing to write home about, but I always carried a spare, and the built-in 2,400-bps modem was my lifeline as I traveled domestically and internationally. The 2MB RAM disk wasn't blazingly fast as desktop RAM disks go, but it blows

away any hard disk. Moreover, it didn't need to spin up before the machine could boot. Unlike the other pretenders to the notebook category, the UltraLite was close to instant-on. You really could pull it out, flip it on, and take notes.

Today, my battle-scarred UltraLite is taking a well-deserved rest. One side of the lid no longer snaps closed. The keyboard occasionally freezes when using *ProComm*, requiring a cold boot. Various doors and access hatches in the plastic case have fallen off or worked loose, sometimes with dramatic results. Twice, a hatch on the underside of the machine has opened, and I inadvertently touched a chip or two, resulting in a scrambled RAM disk. I should have taped the doggone thing shut, but I knew the UltraLite was headed for the portrait gallery.

Today, I'm carrying the Texas Instruments TravelMate 2000. At less than 4.5 pounds with a 12-MHz 286, 3MB of RAM, and a 20MB hard disk, it's seemingly everything I need for the road. Yet I wonder if it'll be here for the long haul. Initially, I was worried about the machine's mechanical integrity, but so far it's withstanding the rigors of daily use.



ILLUSTRATION: SHANNON JEFFRIES

TI has bundled some extra software utilities that create added value over its Sharp and CompuAdd brethren, and the VGA screen is wonderful. I plug a MousePen into the serial port and run *GeoWorks Ensemble* on the road. But I miss some of the UltraLite's features, especially the speed of the RAM disk. I also miss the TSR setup program, which you could pop up in the middle of applications to change the color mapping, the gray palette, or half a

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Bill Machrone

dozen other useful settings.

The TI/Sharp/CompuAdd all have a SetUp key in the upper right-hand corner of the keyboard, an ideal location for the oft-used Del key. The implementation is dumber than a rock: When you press the key, it jams the string, "SET_UP" into the keyboard buffer. When you're at the DOS prompt, it loads the setup program, but if you're already in an application, you get the string on your screen. The engineers should have designed it to operate only in conjunction with the Function key to avoid the inadvertent presses that clutter up your applications.

LOOKING FOR BETTER, NOT MORE

I'm also at a complete loss as to why manufacturers can't group the function keys in fours (if the machine has 12) and fives (if it has 10), with raised plastic spacers between the groups. Failing that, why can't they just make the middle four keys a lighter color. That way, your fingers would have a fighting chance of finding the one you want. For that matter, there's an untapped trove of ergonomic feedback in sculpted, indented, and raised keytops. Keys that you "shouldn't" press can be designed with higher resistance. Your fingers would detect the differences instantly, just as you automatically find the raised bumps on the F and J keys.

Readers have sent letters characterizing me and my fellow editors here at *PC Magazine* as power-mad megahertz maniacs who laugh at the installed base and sneer at budgets in our quest for ultimate performance. Yet I want *less* in a laptop, not more: less weight, less power drain, less confusion.

As I sit here at 33,000 feet, I've got the all the power conservation features enabled and the processor speed turned down to 7.16 MHz to consume less power. Yet it snapped through a pro forma budget that I whacked together, did some simple graphics that I'll print on a borrowed LaserJet tomorrow, and is digesting these keystrokes with alacrity. The guy across the aisle with the LTE 386s/20 isn't getting any more computing done with the extra horsepower. In fact, he's playing a golf game. It's his first laptop; he thinks it's going to be a long relationship.

Fickle as I am, though, I can't wait to see my next duchess, er, laptop. ■

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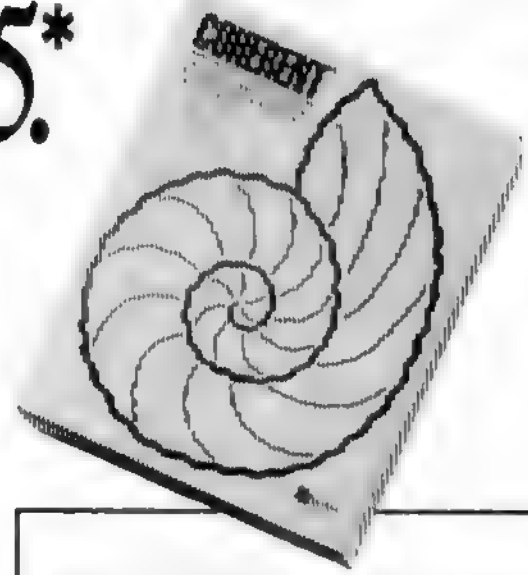
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John C. Dvorak



Like our shadows, our wishes lengthen as our sun declines.—Edward Young, Night Thoughts, 1742

Has Microsoft lost its edge? Over the years Microsoft has developed into a reactive company, not a technology leader. It's as though the company is even more confused about the future than are the users.

This notion, for me, was triggered by an observation made by John-Louis Gassee in a recent *MacWeek* column where he suggested that Apple's boosting of multimedia may actually be a ploy to misdirect copycat Microsoft

into expending resources on what Gassee (and a lot of others, myself included) consider a dead-end. Who is multimedia for? ABC News perhaps, but who among us needs to program elaborate multimedia presentations? Nobody I know.

Microsoft has followed Apple's lead more than once. Apple produces a graphical user interface and Microsoft begins work

on *Windows*. Apple starts to develop BASIC for the Mac and Microsoft jumps in. Apple makes a mouse. Pretty soon Microsoft makes a mouse. Apple develops *Apple Works* and soon we see *Microsoft Works*. I guarantee that Microsoft will copy Apple's latest gimmick—the voice notation system complete with microphone.

These knee-jerk reactions to the market seem to be a theme with Microsoft. In England, Digital Research Inc. (DRI) announced DR-DOS 5.0 and Microsoft personnel were there to note its features. Soon thereafter Microsoft leaked word to *PC Week* that it would release DOS 5.0 with nearly the same features, *before* DRI made its U.S. announcement. More recently, just a week before Go Corp. was to announce its pen-based computer operating system, Microsoft runs around the country showing a pen-based version of *Windows*.

A few years ago Sony and Philips brought out the CD-I standard, and suddenly Microsoft counters with DVI while trying to buy Mi-

croware Systems, the maker of OS/9, the operating system for CD-I. One panicky response after another. People start to chat up Unix so Microsoft invests heavily in the Unix vendor, the Santa Cruz Operation (SCO). When Microsoft puts out a game pack for *Windows* what do we find in it? *Tetris*!

While Bill Gates and the upper echelon at Microsoft present a self-confident attitude when discussing the industry, the company's willy-nilly scrambling from fad to fad in a near paranoid fit makes you wonder. This craziness goes beyond product me-tooism to include packaging, names, and even its numbering conventions. *WordPerfect* comes out with 5.0 and so *Microsoft Word* quickly moves to 5.0. Lotus comes out with *1-2-3* 3.0, so Microsoft follows with *Excel* 3.0.

Microsoft is running after everything it sees. There is no vision. It's chasing pen-based computing, multimedia, PostScript-like page description languages, CD-ROM, DVI, book publishing, both GUI- and character-based computing, games, networking, etc., etc. How thin can they stretch their resources? Hey guys, ever heard the word "focus?"

When I see this kind of mania I recall the



small-time operator who runs the corner repair shop. Inside the owner sells moose heads, and junk jewelry, does toaster repair and lawn mower blade sharpening. He has a tube tester and a slew of nickel gumball machines. His wife is deathly afraid he'll attend one of those scam-ola franchise expos and bring home even more sure-fire get-rich-quick schemes.

Maybe she should just send him up to work for Microsoft.

Myth, Mystique, Mania, and Microsoft

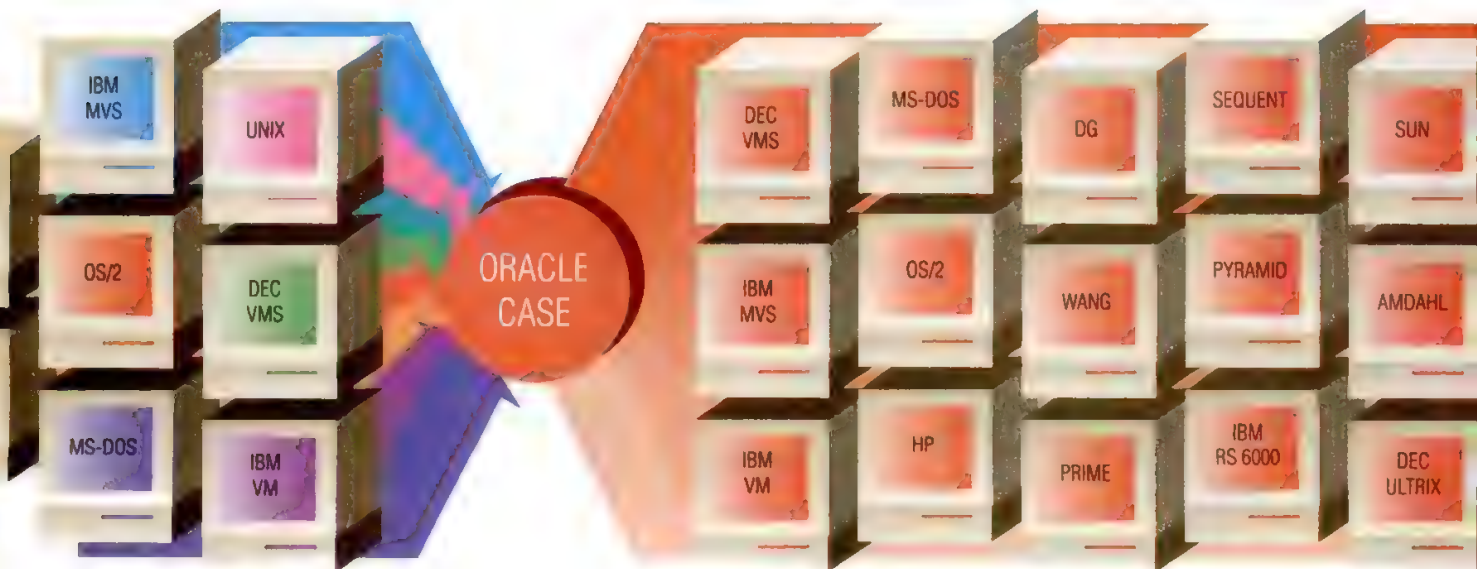
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Go Corp. is the **talk of the town** with the release of its pen-based, or stylus, computing system. Well, this branch of personal computing has "vertical applications" written all over it. After having a good look at these things, I still see the category as little more than a **dedicated tool for the insurance salesmen**. The much discussed handwriting recognition is an **inadequate annoyance** that will remain **useless** for years to come unless we all suddenly become expert calligraphers.

The Go Machine was largely designed by Robert Carr, who is something of a **software design genius**. Carr is one of those guys who is so good that he is treated like an artist and allowed to do his own thing. Unfortunately, his previous inventions, which include *Context MBA* (an early "integrated" system, if not one of the first), and *Framework* have not met with the success first anticipated. Carr seems to be **consistently ahead of his time** and happens onto a scene with **no clear target**. He's kind of shooting in the dark.

The Go Machine utilizes a proprietary operating system optimized for stylus input. For this necessary creation Carr gets a **bad rap**. "Is it MS-DOS compatible?" asks the chorus of parrots. Since stylus-oriented apps will never appear on desktops, all that anyone should be concerned with is data compatibility. I wonder when users are going to get used to the idea that "MS-DOS compatible" **isn't necessary** in many situations. In this case it's like asking if the CompuServe computers run MS-DOS. Nonetheless, it's obvious that this "flaw" will stick and the Go Machine will become something of an **odddity in time**. This flaw, of course, was enhanced by Microsoft's running around the country with its **quick-and-dirty** implementation of a pen-based version of *Windows*. This pen-based version of *Windows* is vaporware at its finest.

Gates said long ago that he wanted Microsoft to be the IBM of software. By this he didn't mean he wanted it to be a **bonehead big company**; just surviving because of sheer size and stability. He wants Microsoft to **dominate like IBM** dominated its markets over the years. If this means pre-announcing products just to **foil the competition**, then that's what Microsoft will do à la IBM.

While Mentioning Bill Gates Dept.: In the meantime, Bill Gates is reportedly **scouring** the world trying to sign up electronic rights for works of art. As many of you know, Gates is building a **40,000-square-foot home** on Lake Washington near Seattle and intends to have **HDTV screens in each room**. When a dignitary visits Gates, the visitor will first be asked who his or her favorite artist is. A CD-ROM will then select a

Inside Track

slew of works from this artist and project them onto various screens around the home. To me it sounds like something from a **James Bond film**—something SPECTRE would have.

I guess Gates finally decided that he'd better get the electronic rights to this art so he can have both some source material for his projectors and maybe make a **few bucks** selling copies to college art departments. He should probably do a deal in southern California first because if you ask most people in the Pacific Northwest "Who is your favorite artist?" the first answer they give is: **Walt Disney**. Just kidding! No letters, please!

The Irony of It All Dept.: Ashton-Tate may have come out as the **biggest winner** when it lost its suit against FoxPro and others. In the legal battle, Ashton-Tate lost rights to the *dBASE* language, which was declared in the public domain because it was originally developed at JPL with government funds. Since then **both Borland and Microsoft** have decided to produce a DBMS system utilizing the *dBASE* language.

Ashton-Tate, which has steadily lost market share since its release of *dBASE IV*, may actually find **renewed interest** in the once-standard DBMS as it again becomes the focus of attention, much to the **chagrin** of the SQL promoters and the *Paradox* people. Clones make the market grow. Let's face it, IBM wasn't less successful

because of clones. In fact, the clones **made the market explode**. The same thing can happen here in the DBMS arena.

Curious Predictions Dept.: I was at one of those pricey forums where four experts were asked to predict the percentage of 1992's installed base in the PC market that will be devoted primarily to applications running various environments. While the word on the street has it that *Windows* will assume about a third of the market with DOS taking the rest, at the conference only Frank King of Lotus predicted anything close to that by saying perhaps 29 percent of the market will be *Windows*-based. The others felt that **less than 20 percent of the market would be Windows-based**. What was most interesting, though, was Frank King's **weird prediction** that 57 percent of the market in 1992 will be devoted to applications that run under a proprietary GUI. Not *Windows*, not OS/2, not *GeoWorks*.

Brian Dougherty of *GeoWorks* suggested perhaps 6 percent for this category and Mike Maples of Microsoft said less than 1 percent. If you look at the **newest DOS software appearing** you discover that most apps have an **ersatz Windows look and feel**. I suspect this trend will continue and King may be right. Developers take note.

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to be the IBM
of software. He
didn't want it to
be a bonehead
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though.

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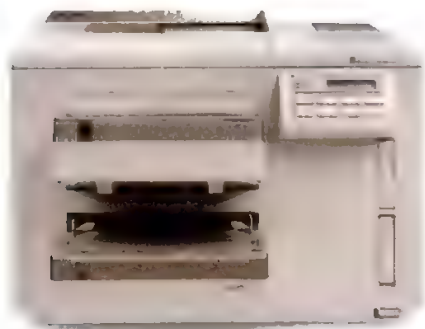
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CIRCLE 125 ON READER SERVICE CARD

Jim Seymour



Network Printers: Do We Get What We Want?

Hewlett-Packard's new LaserJet IIIsi is everything you always wanted in it a networked printer. Or is it?

Sometimes, getting what we think we want is a good test of how well we understood what we needed. Case in point: network printers.

One of the quirks of the PC business is how we accept the notion that the HP LaserJet model of the moment and the current LaserJet clones are good network printers. The original LaserJet was a lousy network printer; the LaserJet 500 Plus was a lousy network printer; the LaserJet II was a lousy network printer; the LaserJet III is a lousy network printer.

Why? Because they're too slow. And they don't have enough paper trays. And the paper trays they do have are too small. And they don't duplex. And their plug-in PostScript options are too slow.

Speed isn't everything in a networked printer—reliability counts most of all—but it's definitely number two with a bullet. And excuse me, but six- or eight-page-per-minute

(ppm) printers just aren't in the game.

And yet literally millions of LaserJets are connected to local area networks. And working beautifully. One of the quirks of the PC business is that LaserJets are so damned cheap—at \$1,600 or so—and so incredibly reliable, that we find it cost-effective to hang LaserJet IIs and IIIs on our LANs, work 'em hard, burn 'em up through overuse, and then throw 'em away.

Except that we never really do seem to burn 'em up, because no matter how hard we drive them, they just keep on working. I know hundreds of PC managers who oversee thousands of LaserJets, but few who've actually worn any of them out.

So because they're insanely cheap for what they can do, and far more reliable than HP, Canon, or any of us thought, LaserJet II's and III's have become the standard network printers in this country.

Even though we *know* we need faster printers, longer design-life printers, and so on. And

even though we pine for that true network printer we say we want to buy.

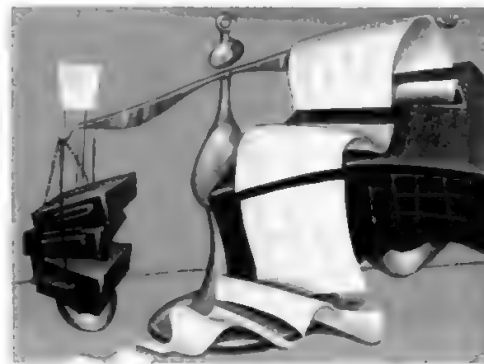
YOU GET WHAT YOU NEED

One of the dangers of wishing too hard for something is that you just might get your wish. That's about to happen with the notion of a fast, affordable network printer. And I think a lot of us are going to decide, sadly, that we didn't really want what we thought we wanted.

Let me explain.

This week, Hewlett-Packard is introducing its latest LaserJet, the IIIsi. It's a monster, in more ways than one. This hundred-pound-plus beast, which is about three times the bulk and weight of the LaserJet III, cranks out 17 pages per minute. First-page time is just 15 seconds. Two fat paper trays hold 500 sheets each; the output bin holds 1,000 sheets. The paper trays automatically chain, so if one runs out, the printer switches to the other.

The LaserJet IIIsi has an internal auto-duplexing option that runs reliably, without jamming and without picking up toner off the first side of each page as the second side prints. It's got a fast, genuine-Adobe internal PostScript option. It connects to parallel, serial, and

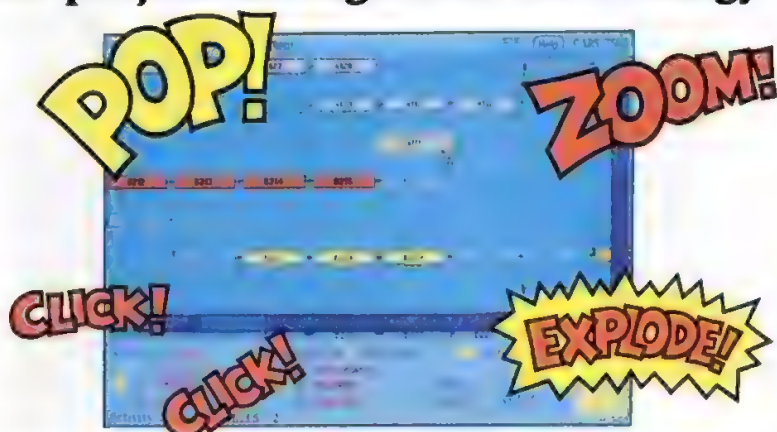


AppleTalk interfaces. And yep, it has HP's PCL 5 page-description language, and the LaserJet III's resolution enhancement feature, so your output looks sensational.

Must cost a bundle, huh?

That's the biggest surprise: the IIIsi costs just \$5,495. Add \$1,034 for PostScript and enough memory to image big pages. Add \$695 for the duplex option. The machine even has a power envelope-feeding option that really

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Jim Seymour

works, for just \$495. Internal network-connection modules cost \$695/\$795: good-bye, PC-XTs used as print-server connection points!

Since those are list prices, knock off at least 20 percent to arrive at typical street prices. In other words, you can have a free-standing 17-ppm high-resolution network printer for less than \$5,000. Or a full-blown 17-ppm, duplexing PostScript machine for well under \$6,000.

Those are sensational prices for this throughput, reliability, and print quality.

I think the LaserJet IIIsi is going to have a long and well-justified reign as the hot LAN printer.

But I also suspect that a countervailing theme is going to work against it, as many of us who screamed for fast, shared printers reconsider our networks' designs.

And as we listen to our LAN users.

Because the single biggest complaint about networks that I hear from PC users is that they get mighty tired of having to walk down the hall to pick up every print job. Or to change paper. Or to make sure the &\$!%#*& printer has the right paper before they submit their job.

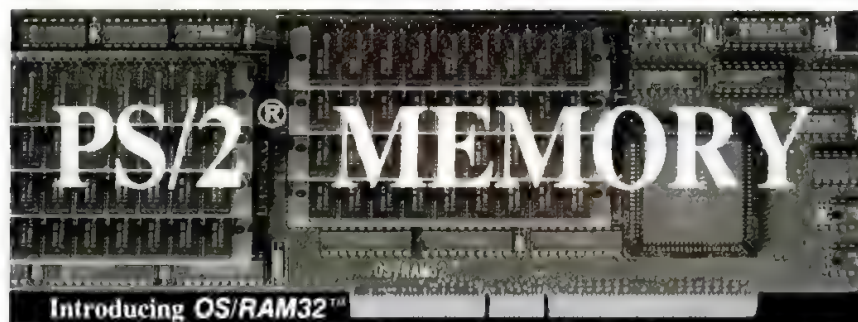
When you're used to twirling around in your chair to pick up pages from a locally connected LaserJet, hiking down the hall to a shared machine does not exactly seem like technology marching boldly forward.

Consider the math: You can have three LaserJet III's for the price of one IIIsi. Sure the IIIsi is faster; sure it'll last longer; sure it has PostScript; sure it'll do duplexing. But listen to those words again: *For the same money, you can have three times as many LaserJet IIIs.* Three times as many printers mean a lot more people are going to have a local, or nearly local printer.

And those people are going to be much happier than if they shared a IIIsi with a full-or of coworkers.

The ideal answer, of course, is to provide a lot of local LaserJet IIIs, and a few shared IIIsis, so users can choose whichever they want. But ideal answers are often costly answers, and these days, many companies can't afford "ideal."

My instinct is that a lot of us who plan networks are going to take a long, admiring look at the IIIsi, sigh, and then sign another P.O. for a dozen LaserJet IIIs. Because the users—our customers—are always right. ■



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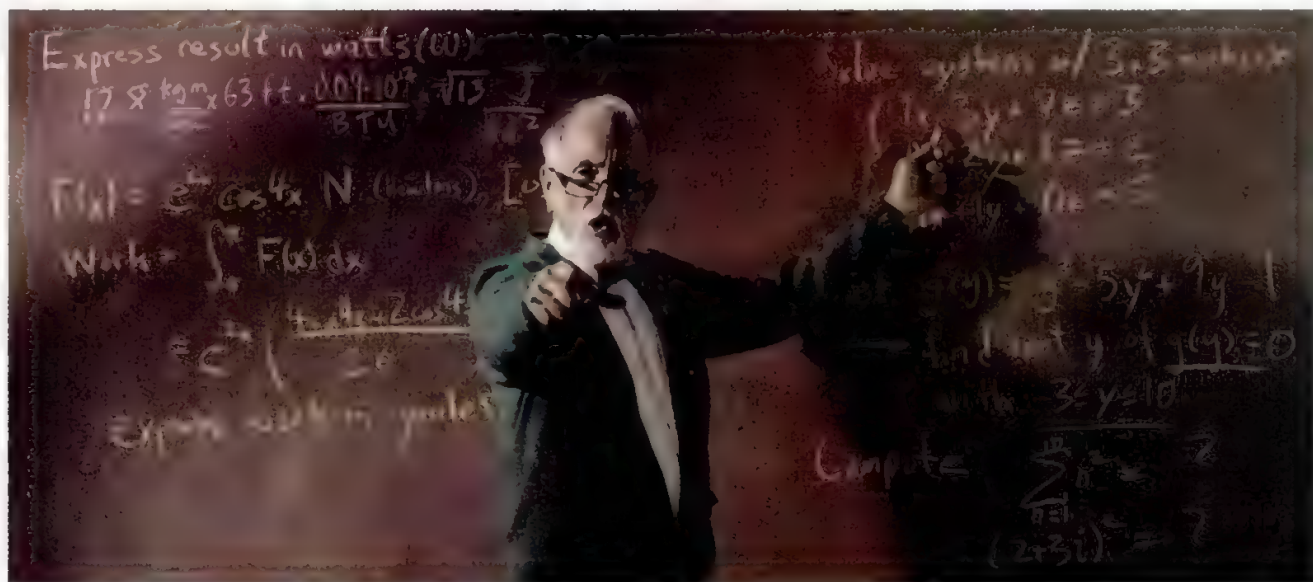


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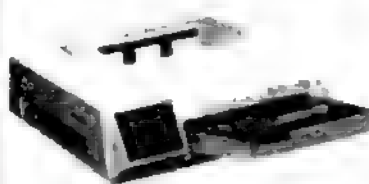
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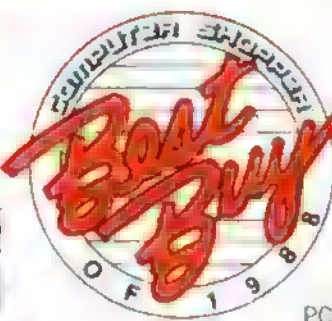
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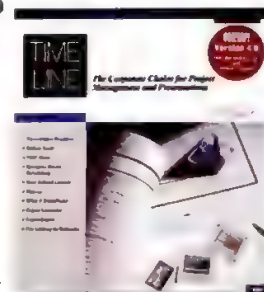
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William F. Zachmann



Who Controls PC Acquisitions?

Everyone in the PC industry wants to know who controls the acquisition and use of computers in the workplace. It makes you wonder if anyone really does.

Who controls the acquisition and use of personal computers in organizations? That is one of the most intensely argued issues among industry insiders, because a great deal depends on what the answer to the question is. The question can also take on any number of forms.

On a personal level, the question typically takes the form: "Who controls the acquisition and use of personal computers in *my* organization?" The meaning of the question varies greatly, however, depending on the particular place of the individual within the organization.

For the vast majority of ordinary users, the issue most typically amounts to, "Can I get the personal computer and software I want and use them the way I want to? If not, whose permission must I get, and what constraints must I accept?"

For the owner, manager, or chief financial officer, the question may mean, "Do we have expenditures for personal computers and their use properly under control? Have we lost control, and should we do something about that?"

For the Information Systems manager, the question may be: "Shouldn't we (IS) control personal computer use and acquisition the way we traditionally have controlled mainframe and minicomputer systems? After all, isn't that our job?"

And for the PC coordinator, the question perhaps is, "Will I lose control to individual users or to the aggressive assertion of authority by the centralized IS organization?"

Vendors share a keen interest in the many expressions of this question, too. For them, it adds up to, "Who really controls the budget and has the authority to choose and buy products in the organization? To whom should I sell my products?"

WHO DO YOU BELIEVE?

Depending on which publication one reads, which week it is read, and which market research experts it happens to quote, wildly different versions of who controls the acquisition

and use of personal computers in organizations emerge.

Some stories claim to discern a trend toward renewed centralization under Information Systems. Others write of reduced power for IS and greater autonomy for individual departments. Some see the role of PC coordinator disappearing, while still others report on successful PC coordinators accomplishing things IS said couldn't be done.

In some cases, contradictory pronouncements on the matter find their way into the same publication from week to week—sometimes even in the same issue! In others, careful observation will reveal a distinct bias toward one view or another.

Publications with a background in traditional data processing tend to favor accounts of how IS is gaining control of personal computers. Publications aimed at individual users, however, are generally more prone to see individual autonomy. Obviously, there is a tendency to say that one's readers are in control, whoever those readers happen to be.

That there continue to be so many different answers to the question of who controls PC acquisition and use in organizations points to

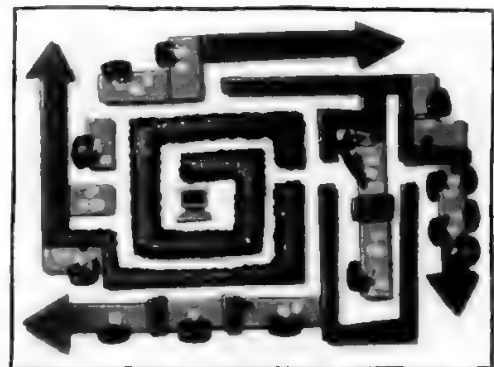


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the real state of affairs, however unsatisfying it may be: *Nobody really knows for sure!*

The reason for that is twofold. First, the underlying reality is far too complex to yield simple answers. Second, it is all but impossible for even the best market researchers to determine accurately what goes on inside most organizations, anyway.

The underlying complexity derives from the extraordinarily "democratic" nature of

William F. Zachmann

personal computers and their use within large organizations. Traditional main-frame and minicomputer systems are by nature expensive and hard to use; both require specialists. Personal computers are inexpensive and can be purchased and used by nearly anyone.

As a result, millions of personal computers have been and continue to be acquired and used in extremely diverse ways, even within the same organization. That complexity is magnified further across different organizations.

Even in the most authoritarian companies—those with the most determined policy of centralized acquisition and control—large numbers of systems bypass the formal acquisition process.

These personal computers simply do not conform to “official” requirements for hardware and software.

In the much larger number of less authoritarian organizations, matters are even more complex. Whole divisions go their own way regardless of what anyone in a centralized IS organization wants them to do. In other organizations, efforts toward centralized acquisition and regulation may be minimal, lacking real authority, or even entirely absent.

Within the same organization, radically different policies may be followed by various divisions. One division may let users do whatever they want to do, as long as they remain within the constraints of a budget. Another group may be highly standardized.

All of these different practices within and among organizations provide the foundation for the second reason why it is impossible to come up with a valid answer to the original question. It also explains why a market researcher will get different answers about how things work in any given organization, depending upon who is asked.

In the very same organization in which the IS director describes PC acquisition and control as highly centralized, a department manager may describe the process as fully within his or her own discretion. In organizations of any size, both may be completely honest yet simply unaware of what fully goes on.

In fact, it is very common to find organizations using not only personal computers, but complex local area network systems that the central Information Systems group knows nothing about. It is quite *uncommon* to find a major organization in which any one source really knows how many personal computers are installed, and where they all are.

The very complexity of the matter, however, gives us ample reason to be skeptical about claims of a widespread pattern toward centralized control. Matters would not be so complex if centralized control were the norm.

In reality, personal computers are acquired and controlled within organizations by those who acquire and control them. This varies widely both within and among organizations. That it does, however, is clear indication that a very large proportion of acquisition and control is *not* centralized and is unlikely to become so for the majority of organizations in the foreseeable future. ■

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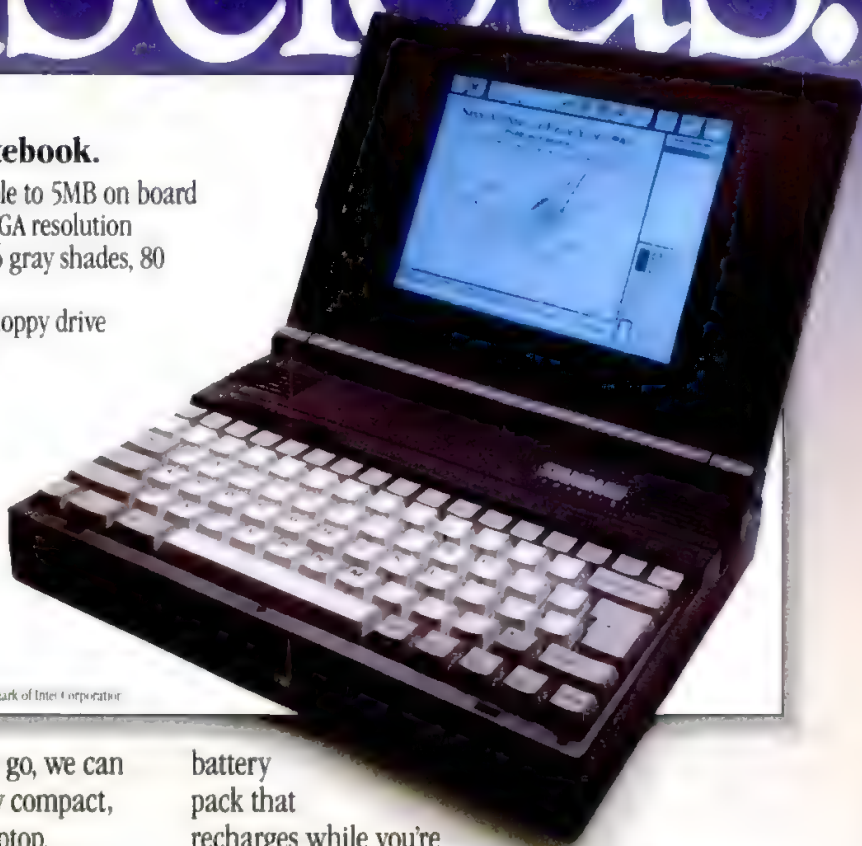
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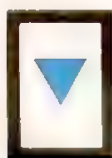


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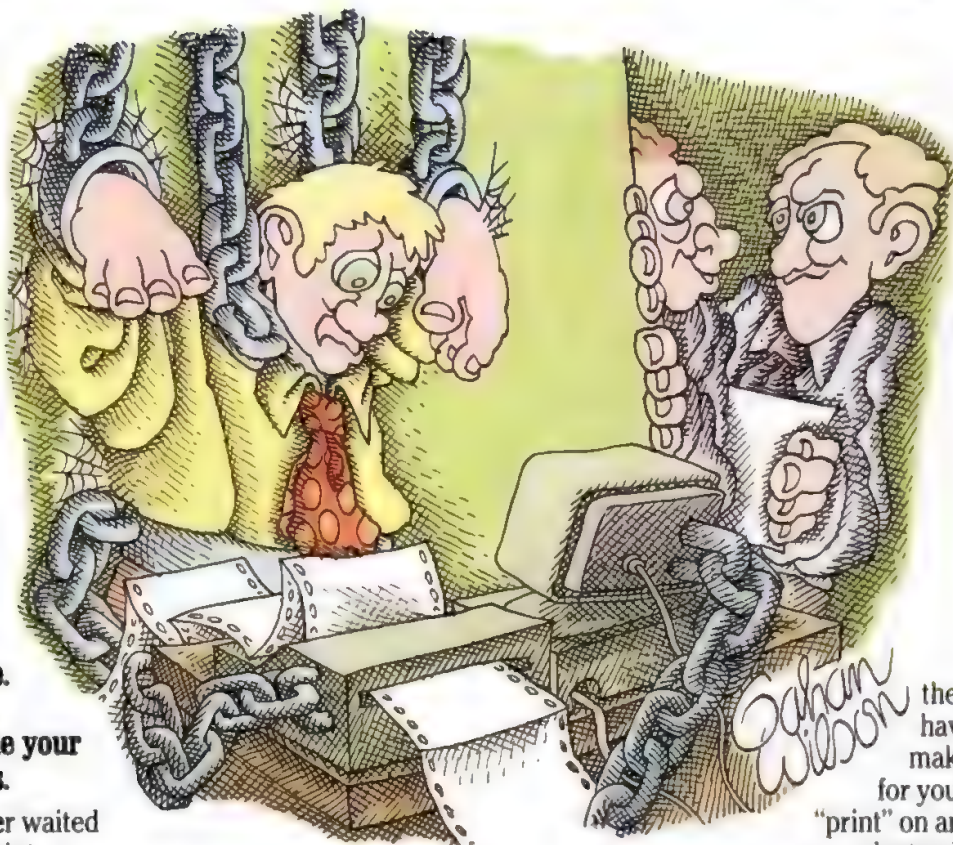
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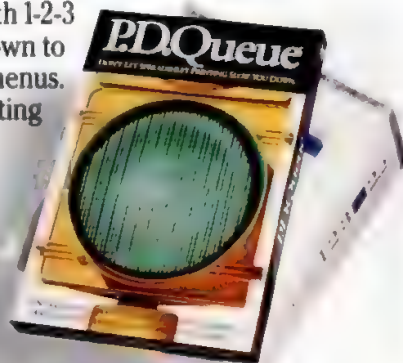
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(617-497-6339 in MA).

**FUNK
SOFTWARE**

Funk Software, 222 Third Street, Cambridge, MA 02142

Requires Lotus 1-2-3 Release 2.0, 2.01 or 2.2, or Symphony Release 1.1 or higher. Works while in 1-2-3, Symphony or any add-in.

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The vast Lotus aftermarket provides software to make the spreadsheet you have do just about anything you want. This overview covers 21 add-ins that make 1-2-3, Release 2.2, a sharper tool for crunching numbers.

LOTUS 1-2-3 ADD-INS:

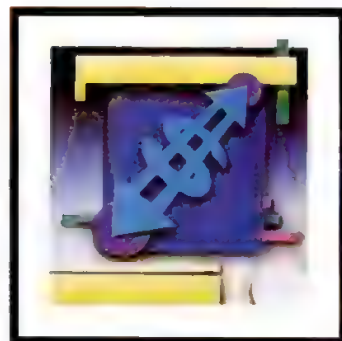
Building The Perfect Spreadsheet

by Craig Stinson

If features tables were reliable predictors of market success, Lotus 1-2-3, Release 2.2, would be a product in deep trouble these days. Borland's *Quattro Pro* and Microsoft *Excel*, to name only two of 1-2-3's strongest competitors, offer more-versatile file linking, vastly superior graphics, better publishing features, a richer environment in which to develop macro-driven applications, the ability to access and manipulate external data tables, and tools for annotating and auditing worksheet logic.

In addition, *Excel* holds out the increasingly credible prospect of smooth integration with myriad applications by way of the Microsoft Windows Dynamic Data Exchange (DDE) protocol.

In measurements of spreadsheet prowess, the world's most popular application lags behind. Yet in one particularly critical measurement



it shines: *1-2-3*, Release 2.2, continues to outsell its competitors by more than two to one.

A major factor in *1-2-3*'s leadership is the gigantic Lotus aftermarket of software that enhances *1-2-3*'s performance. This evaluation covers 21 financial, forecasting, optimizing, and utility add-ins that run within *1-2-3* and make it a better spreadsheet.

GRAVITATIONAL FORCES

Inertia is certainly part of the reason for *1-2-3*'s enduring preeminence. Upgrades and product switches are extremely disruptive and costly. When you have years of training and a metric ton of worksheets, templates, graphs, and macros invested in a product, it takes a compelling argument to make you want to move. So far, no one—not even Lotus itself with *Symphony*, *1-2-3*, Release 3, or *1-2-3/G*—has made that argument convincing.

Enter add-ins. By enhancing *1-2-3* exclusively and specifically, add-ins allow you to build on the investment you've already made. Aftermarket services naturally accrete to the strongest gravitational force and thereby increase its attractive power. The 1991 edition of the Lotus Enhancement Products Directory (available in May from Lotus Development Corp., Cambridge, Mass.; 800-343-5414) lists nearly 500 third-party support products for *1-2-3*, plus several hundred consulting services, training firms, and books.

Introduced by Lotus in 1987, the add-in concept has been widely imitated. So far only *1-2-3*, Version 2.01 (along with its file-compatible successor, Release 2.2) has had enough gravitational pull to create a market of third-party products. Borland's *Quattro* and *Quattro Pro* were designed to accommodate add-ins, but a toolkit with which to develop them never materialized. To date, the only add-ins to appear have been Borland's own *Transcript* (a backup facility) and *Menu Builder* (a utility for customizing the menu tree). The recently shipped *Excel* 3.0 includes add-in capability and comes bundled with a raft of Microsoft accessories (including an optimizer that's functionally identical to Frontline Systems' *What-If Solver*). It remains to be seen, however, if a third-party add-in market will develop for *Excel*.

THE ADD-IN ADVANTAGE

A major segment of the aftermarket is made up of add-ins that cover a wide

spectrum—from generic services such as word processing and worksheet annotation, to highly specific vertical-market applications such as electrical estimating for the construction industry. What they all have in common is that they augment the power of *1-2-3* in specific, focused ways, allowing users to upgrade selectively and as needed.

Suppose you covet the formatting power of *Excel* but don't want to move to *Microsoft Windows*. No problem: Simply attach Funk Software's *Allways* or PC Publishing's *Impress* to *1-2-3*. Neither add-in makes boardroom beauty quite as accessible as *Excel* 3.0, but both come close enough. Do you want your spreadsheet to perform nonlinear optimization, but feel reluctant to switch operating systems and adopt *1-2-3/G*? Check out Frontline Systems' *What-If Solver*. While its reporting capability is less extensive than that of *1-2-3/G*'s built-in Solver, it handles

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the same kind of problems—right inside your Release 2.2 worksheet. You say background printing would let you get more work done, but you're not willing to take on Release 3 just for that? Take a look at *P.D.Queue*. This add-in from Funk Software is less adept than Release 3 at reporting printer errors, but it can manage a background queue of 99 print jobs.

Not only do add-ins save you the trouble of switching spreadsheet programs (and possibly spreadsheet vendors), but in most cases they'll also spare you the expense of upgrading your hardware. *Excel*, *1-2-3/G*, and *1-2-3*, Release 3.1, all require significant amounts of extended memory in addition to 640K of conventional memory and an 80286 or more-advanced processor. Most add-ins do just fine in 640K. The amount of memory they use (in many cases 100K or less) reduces the memory available for your worksheets, but if your favorite add-in leaves your larger worksheets gasping for RAM, you can simply detach it. With an add-in, you get an enhanced version of *1-2-3* when the memory cost is affordable; when it isn't, you can go back to unadorned Release 2.

Lotus has tried vigorously to promote add-in development for its advanced DOS spreadsheet, *1-2-3*, Release 3.1. In an effort to build bridges between all its advanced applications, present and future, Lotus created a new high-level programming language in parallel with its development of Release 3. The Lotus Programming Language (LPL), unveiled in the *Lotus Add-in Toolkit* for Release 3, is explained in the sidebar "A Tour of the Lotus Add-In Toolkit."

Unfortunately, the first release of the *Toolkit* required the use of LPL, while virtually all Release 2 add-ins are written in C or assembly language. This meant that developers had to recode their products from scratch to make them available to Release 3. With market acceptance of Release 3 in some doubt to begin with, developers were in no rush to commit time and talent. A recent upgrade of the Release 3 toolkit that permits the use of C and assembler routines may stimulate the river to flow, but to date only a handful of Release 3 add-ins exist.

LIVING WITH LOTUS TODAY

Meanwhile, the market for Release 2 add-ins continues to flourish, but its character has changed considerably since the last *PC Magazine* review devoted to this topic ("Living with Lotus," January 26, 1988).

That article evaluated three word processing add-ins, one spell-checker, and five database management utilities.

These horizontal add-ins—products aimed at a wide spectrum of users in many

different industries and occupations—had been published on the assumption that a huge population of 1-2-3 users spend the

entire day sitting in front of spreadsheet grids. These Lotus-bound users, according to theory, would eagerly embrace genuine writing and data-management tools, provided they didn't have to visit

THE REAL ADD-IN STORY: Making 1-2-3 More Vertical

by Jim Seymour

So maybe *Lotus 1-2-3* was a little less important than we thought: Three years ago, when we last looked at 1-2-3 add-ins, we marveled at how many business people liked to stay in just this one program, all day. When they had to do something not easily accomplished within that program—say, word processing—they wanted to find a way to do it. So they had pounced on 1-2-3 add-ins. Those add-in programs, which supply many functions Lotus forgot (and some which Lotus no doubt never dreamed of), were beginning to appear in great numbers and seemed likely to extend 1-2-3's reign as the king of the corporate desktop.

Today, while 1-2-3 remains the most popular single program in business use, PC users are less likely to boot it and use add-ins to stay within its familiar bounds than to treat it as one of a suite of applications. Hard data is difficult to come by, but most corporate computing managers agree that the single-program user is much less common now than three years ago, and that the average number of applications used by business people is steadily increasing.

So much for the use of add-ins to create a "one size fits all" program atop the bones of 1-2-3. Indeed, the real story of 1-2-3 add-ins over the past couple of years is that, rather than turning a special purpose program into a general-use package, they've worked exactly the opposite way: They have been turning what we now recognize as a generalized number-crunching program into a series of very different and highly specialized applications. In fact, in areas such as forecasting, financial analysis, and linear programming for optimization, the combination of 1-2-3 and the appropriate add-ins has become the preferred, often dominant choice.

Marc Peterson, president of Personics and producer of add-ins such as *@Base* and *SeeMore*, agrees that add-ins are increasingly being used to turn

1-2-3 into a specialized vertical package. "Though some of our packages, such as *@Base*, provide horizontal functionality," Peterson says, "we increasingly find them being redeployed as tools within highly specialized applications by people using 1-2-3 as a development system."



Ironically, one factor that some thought might fundamentally change the add-in market has *not* materialized: a broader, more-functional version of 1-2-3 itself. While Lotus has acquired the competing spreadsheet-formatting add-ins (*Allways* and *Impress*), bundles them with different versions of 1-2-3, and has incorporated some of the database management smarts of Personics' *@Base* into *Symphony*, Lotus has generally not worried much about extending the functionality of 1-2-3. Some new features and functions have appeared in succeeding releases, but even 1-2-3, Release 3.1, and 1-2-3/G have been characterized not so much by any major extensions of the program's fundamental powers as by incremental additions and backwards compatibility.

PAST, PRESENT, AND FUTURE

Three years ago, we asked the experts where 1-2-3 add-ins were headed and which external functions would be added next, via the add-in path. A communications module was the most obvious missing link. In fact, Eric Shultz, developer of the best of the 1-2-3 add-in word processors, Blossom Software's *Write-in*, said he and his colleagues at Blossom had targeted communications as a target of opportunity.

Yet even today, no standard communications software has appeared as a 1-2-3

add-in. (Beyond, a startup led by former Lotus vice president Chuck Digate, has announced a release of *@Mail*, a limited e-mail add-in, for delivery this year.)

Other experts were just as far off. Three years ago Paul Funk, founder of Funk Software and developer of such add-in packages as *Sideways*, *InWord*, *Note-worthy*, and *Allways*, believed that 1-2-3 users were looking primarily for more-generalized 1-2-3 toolkits.

Today Funk says, "It looked to me that making 1-2-3 even more horizontal by adding functions was the way to go. We later decided to go back to our strategy of enhancing what was already in 1-2-3, to take care of deficiencies people wanted fixed. We had *Sideways* already, and we went on to do *P.D.Queue* and *Allways*." Funk says that very narrow vertical add-ins will also be a profitable market.

Peterson of Personics sees big opportunities for add-ins in succeeding releases of 1-2-3. "We're going to be changing our strategy," he says, "so that our new products appear first for Release 3.1 and 1-2-3's new Windows version, and then we'll go back and redo them for Version 2.x." But he also sees problems for add-in developers in the profusion of incompatible releases of 1-2-3. "It's a nightmare to develop all those versions," he says. "With so many platforms to support, the add-in business is becoming a minefield."

At the same time, those new (and, naturally, incompatible) versions of 1-2-3 should keep the market for add-ins alive for years to come. With Lotus's own strategy focused on delivering same-name/look-alike spreadsheet programs across many hardware platforms, rather than extending the core products with "4-5-6" functions, Lotus will continue to create a rich market for those remora riding its back.

We'll be able to go on fine-tuning the base program more precisely to meet our increasingly special needs. ■

the dreaded DOS prompt in order to do it.

The assumption proved false, as Jim Seymour reports here in "The Real Add-In Story: Making 1-2-3 More Vertical." The sales history of these horizontal add-ins demonstrated that Lotus users were less keen on turning 1-2-3 into a multiple-

application platform than on making it better at tasks it was originally intended to perform. The market for word processing and database add-ins has stagnated and is still dominated by Symantec (4-Word,

Spellin!), Funk Software (InWord), Blossom Software (Write-In), Personics (@Base), Intex (Data Manager), Goldata Computer Services (D.A.V.E.), PC Publishing (Deja!), Informix (Informix Datasheet Add-In), and Manusoft (Fetch*).

A TOUR OF THE LOTUS ADD-IN TOOLKIT

by Christopher O'Malley

As plentiful and varied as it is, the field of commercial Lotus 1-2-3 add-ins is not without limits. There are no add-ins called Bill's Market Planner or XYZ Corp.'s Distribution Analyzer. That sort of specificity demands a custom-made solution, which means programming an add-in of your own—traditionally a forbidding challenge to even the most-experienced 1-2-3 users and in-house corporate developers.

For Release 3.x users and developers, creating your own 1-2-3 add-ins is a considerably less-daunting task with Lotus's *Add-In Toolkit for 1-2-3*. The *Toolkit* is a complete programming environment for 1-2-3, Release 3, that enables you to fashion custom @ functions, macro commands, data entry forms, and with more effort, entire add-in applications. Unlike add-ins created for Release 2, which still must be written in assembly language, add-ins produced with the *Toolkit* for Release 3 are written in Lotus's simpler, plain-English language.

However, be forewarned: The *Toolkit* does not make spawning your own 1-2-3 add-ins a day at the beach; spending a few days to a few months at a construction site is more like it. Officially, Lotus says the *Toolkit* is intended for "advanced macro writers" as well as application developers. Lotus officials are quick to concede that only very advanced 1-2-3 users who've hit a functional wall, or users with some prior programming experience, will feel comfortable working with the *Toolkit* to develop add-ins.

INSIDE THE TOOLKIT

The *Toolkit* consists of five basic parts: the Lotus Programming Language (or LPL), a library of procedures and data structures for 1-2-3, an editor, compiler, and debugger. Using the editor, you write the source code with LPL

commands and library functions. You then use the compiler to correct any syntax errors and generate an object file that can be invoked via the menu and run as a 1-2-3 add-in.

If your add-in doesn't work as expected, you can use the debugger window to follow your code as it runs—but only if you happen to be using OS/2. Unfortunately, the debugger doesn't work with DOS.

Depending on the complexity of the job, creating an add-in with the *Toolkit* can mean a major investment of time and energy. But it's an investment that could pay dividends on other platforms, too. Beginning with Release 3, Lotus officially unlocked the door to its spreadsheet's inner workings with a built-in technology that allows users to design custom business applications. It's that technology that makes the *Toolkit* possible, and Lotus is promising that add-ins written in LPL should run intact on other 1-2-3 platforms such as OS/2 and Unix.

A new version of the *Add-In Toolkit* for Release 3.1 of 1-2-3 is now available. In addition to supporting the new features of Release 3.1, the upgraded *Toolkit* adds a link to procedures written in C, allows debugging under DOS, and provides "event management" capabilities that enable you to write add-ins that can watch for and respond to basic spreadsheet actions, such as saving a file or entering a particular keystroke. The new version should also speed up the performance of most add-ins by a factor of two or more. ■

Add-In Toolkit for 1-2-3, Release 3.0, and Add-In Toolkit for 1-2-3, Release 3.1, Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500. **List Price:** \$395. **Requires:** 2MB RAM; Lotus 1-2-3, Release 3.x; DOS 3.0 or later.

CIRCLE 396 ON READER SERVICE CARD

REVIEW CRITERIA

This evaluation of add-ins includes products in four categories: financial analysis, forecasting, optimization, and utilities. Products in the first three categories are all designed, in one way or another, to make 1-2-3 a sharper tool for performing numeric analysis. The fourth category includes add-ins for managing files, simplifying data entry, increasing available memory, printing worksheets in the background, saving files in the background, augmenting 1-2-3's built-in function library, and creating and debugging macros. We chose to evaluate 21 of the most important 1-2-3 add-ins introduced or improved since January 1988. All 21 work with 1-2-3, Release 2.0, 2.01, and 2.2. A few packages include separate versions for Release 3 as well.

Allways and *Impress*, two hugely successful desktop-publishing add-ins, are not covered here since they are bundled into 1-2-3 Release 2.2 and Release 3.1, respectively. For an evaluation of these add-ins, see "Who Needs a Graphics Package Anyway?" (*PC Magazine*, December 11, 1990).

For all their virtues, add-ins also have a few drawbacks. First, 1-2-3 enhanced by a suite of add-ins is a product upgraded by a committee—typically a committee of competitors. Most add-ins are designed to work harmoniously together, but the potential for conflict always exists.

Second, the more functionality you tack on via add-ins, the more menus and commands you have to master. In some cases—the combination of *Impress* with 1-2-3, Release 2.2, for example—you may find yourself dealing with two or more identically named menus, each with slightly different commands or areas of jurisdiction. The more you add in, the greater your potential for confusion.

These concerns are minor, however, if you're only looking to improve particular aspects of 1-2-3's functionality, such as its financial function library or its suitability as a forecasting tool. In this case, add-ins can help you construct spreadsheets perfectly suited to your tasks and extend the life of your 1-2-3 system for years to come.

Even if you've got the time
and the talent to write your
own 1-2-3 code, why
bother when you can use
one of these six add-in
solutions for knotty
financial tasks?



PHOTOGRAPHY: WALTER CHRYNWSKI / ILLUSTRATION: KEITH LO BUE / CONSTRUCTION: CLAUDIA TELLER

FINANCIAL ADD-INS:

A Wealth of Spreadsheet Shortcuts

by Mike Falkner

Lotus 1-2-3 has the ability to handle many financial scenarios, but today's sophisticated financial environment often requires you to build complex formulas and memory-robbing tables. This demands significant development time that you could spend on analysis.

This collection of add-ins addresses the shortcomings of 1-2-3 and frees up your time for analyzing information instead of building spread-

sheets. Since each package has its own objective, we do not compare them feature by feature. Instead, we evaluate them for finesse in executing tasks and the usefulness they provide to the 1-2-3 user. Packages like *Financial Toolkit*, *Financial @nalyt*, and *The @Library General Applications* add more @ functions to 1-2-3, reducing complicated tasks to a single formula. *The Budget Express* makes it simpler to create

forecasts and review your work, and *Instant Analyst* helps you quickly spot trends. To whisk your accounting data into 1-2-3, there's *F9*.

Whether you just want some of the drudgery removed from your spreadsheet tasks or need a substantial package that breaks through 1-2-3's limitations, you'll find solutions in these add-ins.

The @Library General Applications

by Mike Falkner

GreyMatter International offers three versions of *The @Library*: general statistical, and scientific and engineering applications. We evaluated the \$79.95 general add-in, which plugs some holes in 1-2-3's function library with 48 general purpose @ functions. You may find *@Library* to be a lean tool for financial analysis, since 40 of the functions perform vector algebra and statistical, date, and string calculations. Not strictly a financial tool, *@Library* is a good choice if you need this broad range of functions.

Recognizing that you may not need all 48 functions, GreyMatter supplies *@Library* as a single add-in file and as a set of four files, each one holding a related group of functions. If you just need financial and date functions, for example, just attach the 8K *@FINDATE* add-in instead of the entire 35K add-in.

To install *@Library*, you use a simple install program or just copy the *@Library* add-in and the help file into your 1-2-3 directory. Use /Add-in to attach *@Li-*

brary to load the functions. Once you attach *@Library*, it is invisible, co-existing with 1-2-3's other @ functions.

LOAN CALCULATION SHORTCUTS

As a financial tool, several of the *@Library* functions are convenient shortcuts for calculating loan information without building an amortization table or creating a formula. *@CINT* and *@CPRIN* calculate the interest and principal accumulated up to a certain period. Their siblings, *@FINT* and *@FPRIN*, calculate the interest and principal portion of one payment in a single period. Without these functions, you would have to build an amortization table that calculates the interest and principal paid for each period and accumulates them as running totals. Using

Payment number	Beginning Balance	Interest	Principal	Ending Balance	Cum Interest
1	10000.00	83.33	170.29	9829.71	83.33
2	9829.71	81.91	171.71	9658.00	165.25
3	9658.00	80.48	173.14	9484.85	245.73
4	9484.85	79.04	174.59	9310.27	324.77
5	9310.27	77.59	176.04	9134.23	402.36
6	9134.23	76.12	177.51	8956.72	478.48

**The @Library
General
Applications'**
**@FINT and @CINT
functions**
eliminate the need
to create an
amortization table
to calculate the
interest paid for a
single period and
the interest
accumulated up to
a period.

1-2-3's *@VLOOKUP* on a period number, you'd come up with the same results that *@Library* gets with one cell.

The functions *@EFF* and *@NOM* are mere shortcuts that return the effective and nominal interest rate for a given interest rate. Although you can use just one 1-2-3 formula to replace each function, using the add-in's *@EFF* to calculate the effective rate is a whole lot simpler than remembering the formula $(1 + (\text{int}/\text{periods}))^{\text{periods}}$.

BETTER FORECASTS

Although the remaining *@Library* functions do little with financial calculations, several do help you create a better forecast. Instead of placing the date (02/15/91, for example) at the top of your report, you can use *@LDATE* to make it more professional as "February 2, 1991." You can use the functions *@NESUM* and *@NECOUNT* to sum and count a range of cells, similar to their 1-2-3 counterparts *@SUM* and *@COUNT*. Unlike 1-2-3, however, they skip *@NA*'s and *@ERR*'s, eliminating inadvertent division by zeros and other errors, guaranteeing a value at the bottom of the column.

The *@Library* also includes an optional help add-in called *@LIBHELP* to assist you when you can't remember the syntax for each function. When you hit the hotkey that you assign to *@LIBHELP*, you'll get a display including the name of each function group in a 1-2-3-style menu. Simply select the group that you want to view on-screen, and the add-in displays the syntax and a brief description of all functions residing in that group.



EDITORS' CHOICE

- Financial @nalyst
- Financial Toolkit

Many of these financial add-ins can assist you in marshalling Lotus 1-2-3 data to cut the time you spend analyzing financial tasks and performing complex calculations. Two packages stand out: Intex Solutions' *Financial Toolkit* and Tech Hackers' *Financial @nalyst*. They stretch the capability of 1-2-3 and have the depth of functionality and the smarts to save you time.

While both packages provide calculations for net present value, future value, and loan amortizations, *Financial @nalyst*

stretches beyond those tasks to provide more options for complex cash-flow analysis and loan amortizations.

Bringing valuable functions to a specific market—loans and investments—*Financial Toolkit* handles adjustable rate mortgages, bond calculations, and depreciation calculations. And it's now compatible with 1-2-3, Release 3. (Tech Hackers does provide add-ins to *Financial @nalyst* that address these areas, but they are sold separately.)



FACT FILE

The @Library
General

Applications,
Version 1.0
 GreyMatter
 International Inc.,
 P.O. Box 388,
 Cambridge, MA
 02141; 617-876-
 6969.

List Price: \$79.95.

Requires: 35K RAM (including 15K help add-in), or 8K RAM if only the date/financial module is loaded, DOS 2.0 or later.

In Short: The @Library is a set of general-purpose functions covering more than financial calculations. It handles basic loan and amortization problems well, but lacks the depth needed for a serious financial analysis tool.

CIRCLE #18 ON READER SERVICE CARD

The @Library doesn't pretend to be a hotbed of financial functions, and compared with packages like the *Financial Toolkit*, it obviously isn't. The @Library's financial functions are a small part of the package, while the functions in the *Financial Toolkit* are sophisticated and targeted at the financial professional. The @Library loan functions handle simple, fixed-term loans, while the *Financial Toolkit* goes much farther, handling mortgages with adjustable rates, graduated payments, and balloon payments at the end of a note.

The financial functions in the @Library are reliable, but not strong enough to handle today's complex financing arrangements. Unless you're looking for basic loan and annuity calculations or a general purpose @ function library, save the space set aside to add-in @ functions for a more-sophisticated financial package.

The Budget Express

by Mike Falkner

You can't do a good spreadsheet analysis unless you build a good spreadsheet. *The Budget Express*, a \$149 add-in from Symantec Corp., cuts down the time needed to build your model and gives you powerful tools to speed up your analysis.

Like most 1-2-3 add-ins, you can install *The Budget Express* with a setup program or simply copy it to your 1-2-3 directory. You use /Add-in Attach to load *The Budget Express* and then assign it to one of four Alt-key combinations to invoke it. Once attached, *The Budget Express* uses 64K of

conventional memory and up to 256K of EMS when available for goal seeking and consolidations.

The Budget Express documentation is clearly written. The package comes with an excellent tutorial and example files that bring you up to speed quickly. While in 1-2-3, press F1 and you get context-sensitive help.

The Budget Express begins its work right away as you start building your spreadsheet. When you type a date at the top of a column and move the cursor to the right, *The Budget Express* anticipates your next move by loading the next month into the 1-2-3 edit line as if you typed it. After you enter row labels, you can use *The Budget Express* to indent a range of row labels by a fixed number of spaces and, based on how you indent the labels, automatically create total lines at the bottom of each group of rows.

OUTLINING AND TREND ANALYSIS

Once you establish row groups in your forecasts by indenting labels, you can use *The Budget Express*'s powerful outlining feature to summarize your spreadsheet. Using the Hide option, you can reduce a range of rows to a single row that contains the title you used at the top of the section and the total you created at the bottom. Use Hide with your cursor in a column heading to reduce monthly columns to quarterly or yearly columns. By reducing rows and columns, you can fit your entire spreadsheet onto a single screen for easy review. Later, when you complete all of your work, you can expand the rows or columns with the Show option.

The Budget Express not only summarizes your data but also helps you analyze trends without adding more formulas. With the Analysis option, *The Budget Express* calculates the change between months and places the values where the original information was shown. If you prefer, you can also calculate the percent



FACT FILE

The Budget Express,
Version 1.10

Symantec Corp.,
 10201 Torre Ave.,
 Cupertino, CA 95014;
 408-253-9600.

List Price: \$149.

Requires: 64K RAM,
 DOS 2.0 or later.

In Short: *The Budget Express* helps you to build spreadsheets faster and enhances your ability to view and manipulate information. Although 1-2-3, Release 2.2, reduced the need for the package's consolidation feature, the remaining functions can still save you time and effort.

CIRCLE #17 ON READER SERVICE CARD

change between periods, the running totals, or the percent change in running totals. You simply use Restore to bring back the original information.

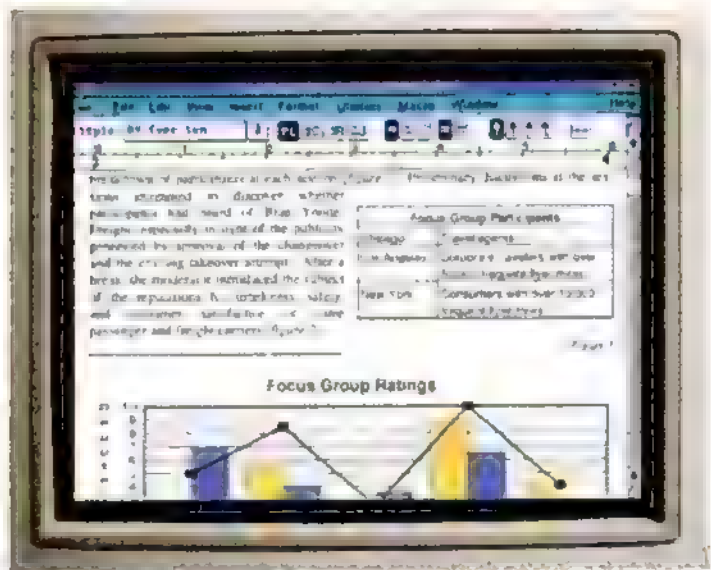
When you modify a forecast, you often save a copy beforehand in case you change your mind. Using *The Budget Express*'s Goalseek option, you can modify cells and ranges without losing your original information. You point to a cell and enter the number that you want—the goal. You then specify a range, change it by a percentage or amount, and watch the cells and a status bar report the results. You can

G10: (,2) 3600
 Enter range for modification: \$13.610

Expenses	Jan	Feb	Mar	Apr
Facilities				
Rent	3,000.00	3,000.00	3,000.00	3,000.00
Utilities	400.00	375.00	300.00	1,075.00
Maintenance	250.00	250.00	250.00	750.00
Total Facilities	3,650.00	3,625.00	3,550.00	10,825.00
Payroll				
Manufacturing	8,000.00	8,000.00	8,000.00	24,000.00
Marketing	2,400.00	2,400.00	2,400.00	7,200.00
Corporate	3,000.00	3,000.00	3,000.00	9,000.00
Legal	10,000.00	10,000.00	10,000.00	30,000.00
Total Payroll	23,400.00	23,400.00	23,400.00	70,200.00
Advertising				
Print	300.00	300.00	300.00	900.00
Radio	250.00	250.00	350.00	850.00
Television	0.00	0.00	1,000.00	1,000.00
Total Advertising	550.00	550.00	1,650.00	2,750.00
Total Expenses	27,600.00	27,775.00	30,900.00	86,075.00

The Budget Express's Goalseek option allows you to set a goal and then modify a range of cells by an amount or percentage to reach that goal.

Word for Windows redef

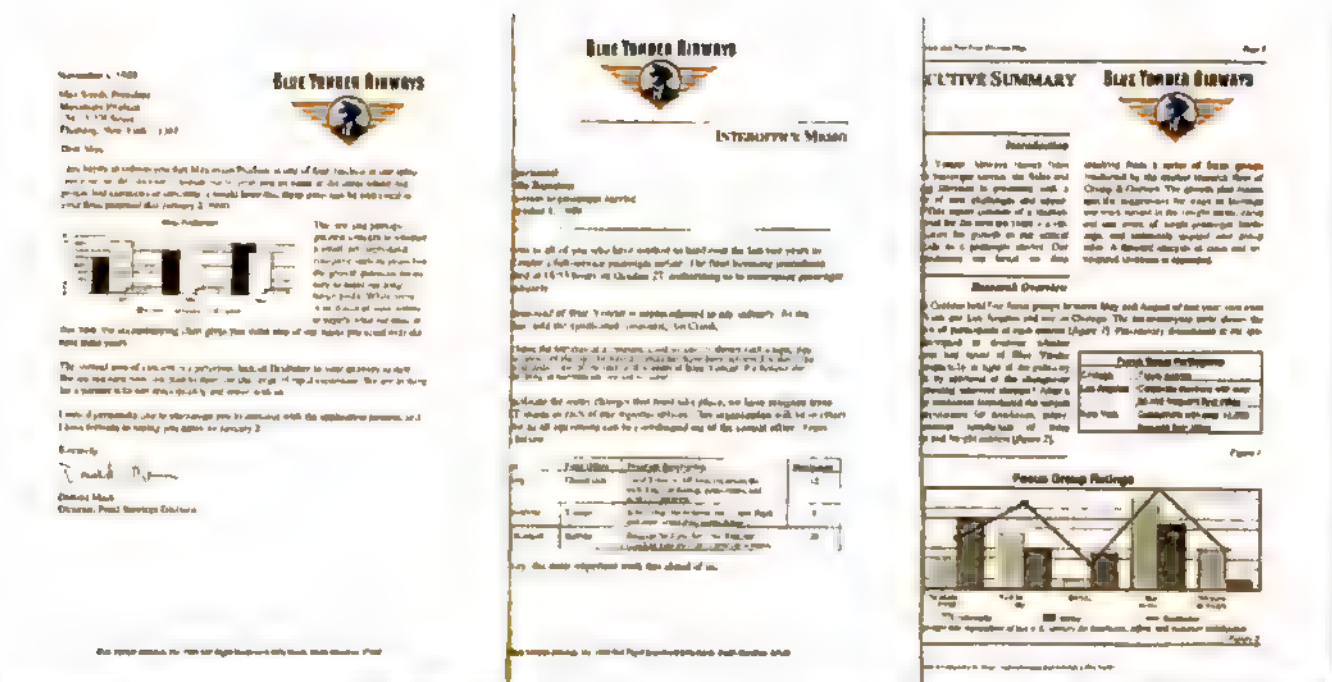


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undo recent changes, save the revised spreadsheet, or restore the original spreadsheet when you're finished.

SPREADSHEET CONSOLIDATION

One of *The Budget Express's* more powerful and complicated features is its ability to build a consolidated spreadsheet from several files. You build a consolidation configuration by selecting the files to merge and by describing the method used to combine each row. You can match rows by labels, location on the spreadsheet, or by manually linking the rows. *The Budget Express* then reads each file and generates a consolidated spreadsheet based on your specification.

Now that *1-2-3*, Release 2.2, has spreadsheet linking, however, you can get by without *The Budget Express* for most consolidations. Goal seeking, consolidations, and outlining require additional conventional memory, so you'll need to reserve some memory for these tasks. To conserve memory, it would be helpful to have several smaller add-ins for the independent functions like consolidations and outlining so you could select and load only what you need.

The Budget Express reduces the drudgery of creating budgets and enhances your ability to view and manipulate information. With patience you can accomplish what you set out to do with *The Budget Express*, but you'll need a few hours before it pays for itself.

F9

by Thomas White

The majority of the financial analysis done by today's businesses centers on information in accounting systems. Unfortunately, PC-based accounting systems lack the analytic capabilities of *1-2-3*, forcing you through the awkward steps of downloading data and importing it into *1-2-3*, or worse, rekeying the data. *F9*, a \$599 package from Synex Systems Corp., provides a quick, easy approach to transferring your general ledger data into your spreadsheet.

Synex Systems, which also developed the *SQZ! Plus* and *Cambridge Spreadsheet Analyst* add-ins, has designed *F9* to import data from popular general ledger systems directly into *1-2-3*. Each time you press the F9 key, the program extracts the desired general ledger information in the blink of an eye to keep your spreadsheet

DEMONSTRATION, INC.		
For the 3 months ending March 31st 1994		
SALES		
Sales - Software		285,500
Sales - Hardware		52,450
TOTAL SALES		337,950
COST OF SALES		
Beginning Inventory		74,000
Purchases		135,000
Direct Labor		0
Overhead		0
Ending Inventory		254,230

updated. *F9* comes in versions for *AccPac Plus*, *Great Plains Accounting Series*, *Macola*, *Platinum*, *SBT*, and *Solomon*. Versions for *RealWorld*, *MAS 90*, *Lake Avenue*, and *Peachtree* are expected soon.

LEDGER-TO-SPREADSHEET LINK

The Install program copies all *F9* program files to your *1-2-3* program directory, and if necessary, installs the Lotus Add-in Manager. If your accounting system is based on Novell's Btrieve database, as *Platinum*, *Macola*, and *Great Plains* are, you must load the Btrieve manager into memory before accessing *1-2-3*. (You'll lose another 75K of RAM on top of the 89K required by the add-in.)

When creating a new spreadsheet, you first access the *F9* Setup menu to define several defaults so you don't have to specify them within each @ function you create in the spreadsheet. You can set defaults for company identification, the current accounting year, the DOS directory where the accounting data files reside, any rounding needed as the data is brought over, and cell labels for imported data that contain zeros or a requested account that doesn't exist. If you forget what an option does, you can press F1 within the *F9* menu for help.

You can then access the Chart menu option to select the general ledger data you want to bring into *1-2-3*. You select the View option to display current general ledger data, and then you're able to point and highlight (similar to the *1-2-3* Copy command) those elements to insert into your spreadsheet. Once you've made your selection, *F9* prompts you for the location

F9 allows you to bring your accounting data—such as the account number, account description, and year-to-date balances shown here—directly into *1-2-3*. The next time you access this spreadsheet, simply press F9 to retrieve the most-current accounting data.

in your spreadsheet where you want the data.

EIGHT HANDY FUNCTIONS

The cells you create with the Chart option display one of eight *F9* functions. @GL brings over account balance data; @NGL performs the same duties as @GL but reverses the sign; @DESC brings over the account description, such as cash; and @ACCTTYPE imports the account type, such as asset or liability. Other functions include @CONAME, @CURRPERIOD, and @CURRDATE, which display company name, current period, and date of the last closed period, respectively. You may be disappointed with @CURRDATE, which brings the date over in a format that



FACT FILE

F9, Version 1.00
Synex Systems Corp., 800-1176 W. Georgia St., Vancouver, BC, Canada V6E 4A2; 604-688-8271.
List Price: \$599.
Requires: 512K RAM, DOS 2.0 or later.

In Short: *F9* extracts financial information from popular general ledger systems directly into *1-2-3*. Its ability to bring over different types of data, such as account balances and budgets for any period or company, summarized to any level, makes this an exceptional tool for any business requiring stronger analysis, reporting, or consolidation capabilities than its accounting software allows.



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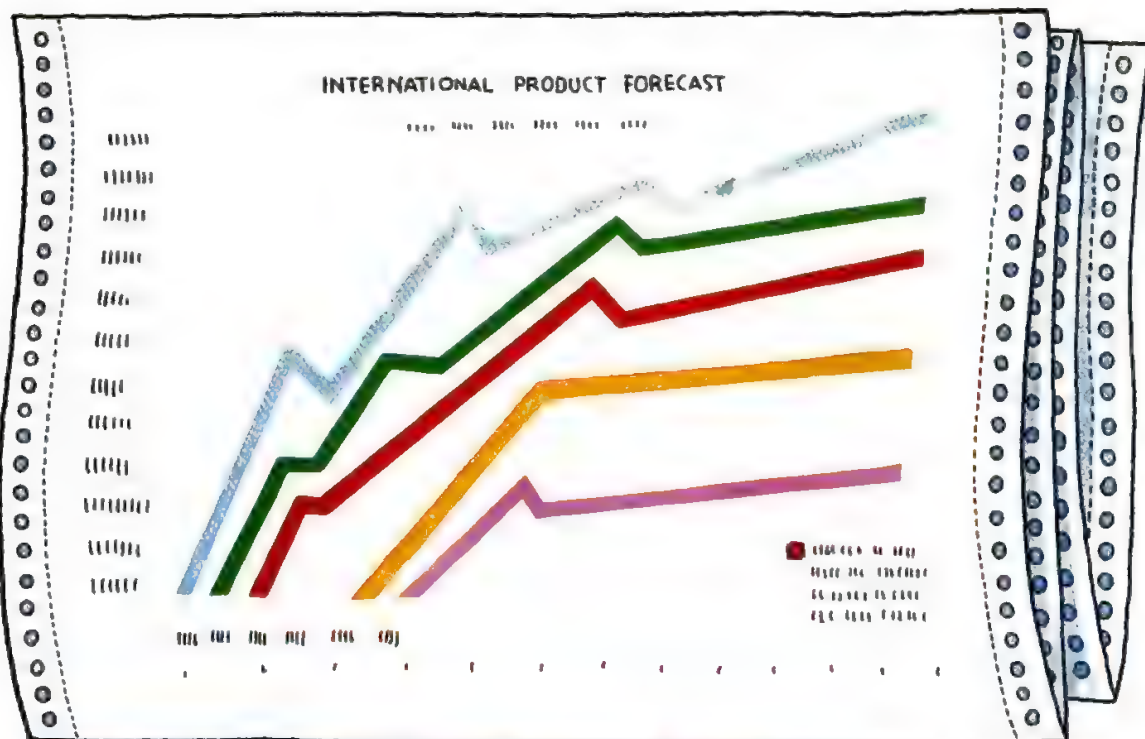


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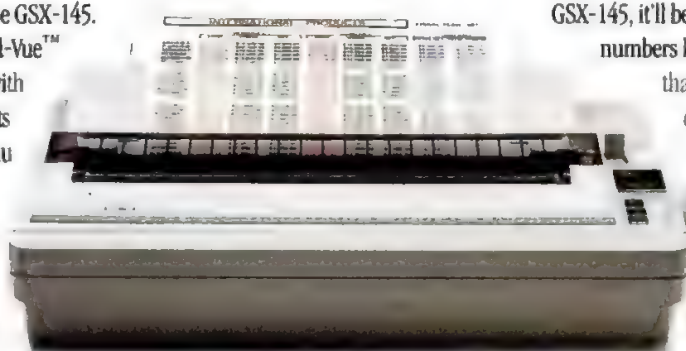
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culating the day of the week a certain date falls on, the date of the "nth" occurrence of a specific weekday (the 3rd Tuesday in April, for example), and determining the starting date of the quarter that a particular date falls within.

Another module has nine functions for calculating business days so you can calculate the number of business days between two dates. Beware, however, that this add-in doesn't automatically determine holidays. It searches a list of holidays that you create as a range within your spreadsheet.

The final two add-ins provide functions that are math oriented. The first converts a decimal number to a fractional number and vice versa. This is handy for bond calculations in which it is common to represent the bond price in 32nds. For instance, before a conversion to a fractional number, a bond price would be represented as 85.625; as a fraction it would be 85.20, in which the 20 represents 20/32. The second add-in provides advanced algebraic calculations such as factorials and linear interpolation.

For those of you who have built huge, overly complex spreadsheets to make up for the limitations found in the 1-2-3 financial functions, you'll find *Financial Toolkit* a blessing. For those who don't have enough time or fortitude to create that type of spreadsheet, you now have one less excuse.

Financial Toolkit

by Mike Falkner

It takes a lot of work to get what you want out of 1-2-3's financial functions, especially when you're handling complicated loans and investments. *Financial Toolkit*, a \$199.95 add-in from Intex Solutions, tackles these tough issues with 20 @ functions that can handle just about any situation involving interest. For more specialized financial features, Intex recently extended its product line to include add-ins for bond, mortgage-backed, and option price calculations.

To install *Financial Toolkit*, you simply copy a single file to your 1-2-3 directory and attach the file FTK with the /Add-in menu choice. 1-2-3 brings the functions into memory, using up 15K RAM. The documentation is exceptional, clearly describing the syntax and use of each function in great detail. With this description, you often get five or more robust,

real-world examples to clarify any doubts about the use of a function.

FINE-TUNED SOLUTIONS

The format of *Financial Toolkit*'s @ functions are similar to 1-2-3's financial functions, with each function preceded by an "@FTK_". For example, @FTK_PMT() calculates the payment required for a mortgage much like 1-2-3's @PMT(). However, *Financial Toolkit* functions go beyond the 1-2-3 calculations and use up to seven arguments to implement solutions for more-complex loan or investment problems. One function, @FTK_BAL(), calculates the remaining balance of a loan and uses the loan amount, payment, interest rate, number of payments, and the timing of payments (at the beginning or end of the period), which is the method used for calculating interim interest and the reporting period to fine-tune the calculation.

Financial Toolkit matches 1-2-3's fi-

The flexibility in *Financial Toolkit* makes it a valuable tool for a loan officer, construction loan planner, or investment analyst who needs more than simple loan calculations. Within the function, interest rates can also be either a single number or a range of percentages. This is perfect for calculating adjustable rate and graduated payment mortgages. When applicable, the functions will accept balloon payments and interest caps on adjustable rate mortgages. Instead of building amortization tables to come up with the value for a certain period, you simply specify the period that you want and get the right value.

HEAVYWEIGHT INVESTMENTS

One of the *Financial Toolkit*'s more-powerful features is the ability to handle partial interest payments due at the start of a loan. To calculate the interest for 15 days before a 48-month loan begins, for example, you simply use 48.5 as the term of the loan and select one of many calculation methods (zero payment, interest

C10: (F2) @FTK_ARM(0,0,00.013,03,0)

Traditional Method

Term: 60 months

Pat No.	Interest Rate	Beginning Balance	Payment	Interest	Principal	Ending Balance
1	0.03%	10000.00	253.63	83.33	170.29	9829.71
2	0.03%	9829.71	253.63	81.91	171.71	9658.00
3	0.03%	9658.00	253.63	80.48	173.14	9484.85
4	0.79%	9484.85	251.37	75.09	176.28	9308.57
5	0.79%	9308.57	251.37	73.63	177.67	9130.90
6	0.79%	9130.90	251.37	72.29	179.08	8951.82

Financial Toolkit Method

Payment four: 251.37

Formula: @FTK_ARM(0,0,00.013,03,0)

10-Dec-90 11:25 AM

Without *Financial Toolkit*'s @FTK_ARM() function, you must create an amortization table for an adjustable rate mortgage to calculate principal and interest for a period. With @FTK_ARM(), you need only a single formula.

nancial functions and adds several more. @FTK_PV, @FTK_FV, @FTK_PMT, @FMT_INT, and @FTK_TERM mirror their 1-2-3 counterparts, with the added flexibility of more arguments. @FTK_ARM and @FTK_CAP handle adjustable rate mortgages, calculating payments and capping a range of interest rates. Two functions calculate nominal and effective yields, four give you details on payments and balances for a period, two more handle graduated or stepped payments, and four others help measure investment risk. A sleeper function, @FTK_DEP, calculates depreciation using six different methods.

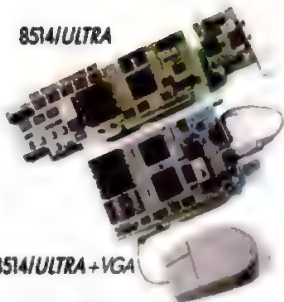
only, full payment, pro-rata, bond). The *Financial Toolkit* calculates the partial interest and principal and adjusts the loan balances accordingly, saving you the hassle of creating a complicated formula from scratch.

To really use the *Financial Toolkit*, you should have a good grasp of 1-2-3 and some background in working with loan calculations. While the examples guide you through many scenarios, you need to understand how your loan works. If not, you'll have a difficult time matching it to the examples. The package could also use a help add-in as a memory jog. With six or

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FACT FILE
EDITORS' CHOICE**Financial Toolkit,
Version 1.0**

Intex Solutions Inc.,
161 Highland Ave.,
Needham, MA
02194; 617-449-
6222.

List Price: \$199.95.

Requires: 10K RAM,
DOS 2.0 or later.

In Short: *Financial Toolkit* has 20 @ functions with the power to solve heavyweight loan and investment calculations. It handles difficult scenarios (adjustable mortgages, graduated payments, balloons) with a minimum of hassle.



CIRCLE 620 ON READER SERVICE CARD

more arguments in some functions, it's difficult to remember their syntax without help.

If you've ever created a forecast with a complicated loan, you'll truly appreciate the *Financial Toolkit*. It not only implements heavyweight loan and investment functions, it also backs them up with the business acumen to help you make them work.

Instant Analyst

by Thomas White

Instant Analyst is the newest addition to Personics Corp.'s line of successful spreadsheet add-ins, including *SeeMORE* and *@Base*. The \$69.95 1-2-3 add-in is designed as an easy-to-use tool to assist you in analyzing trends and relationships in your spreadsheet. *Instant Analyst* provides two basic features: the ability to display one or more cells in a certain color if the data in those cells meet a specific criteria, and the ability to set up ratio calculations easily.

To install *Instant Analyst*, you simply type IASETUP from the A: prompt so that the software will copy the necessary files to your Lotus directory and install the 1-2-3 Add-in Manager if you have not already done so. The installation routine will also configure 1-2-3 to auto-load *Instant Analyst* each time you start up 1-2-3. *Instant Analyst* uses 41K RAM.

SMART COLORS

The ability to apply colors to your spreadsheet is a convenient feature if you need to identify exception conditions quickly. You can highlight in green all sales figures that

are more than 110 percent of budget or highlight in blinking red the investment analysis data that doesn't meet your desired rate of return. To invoke the colors feature (*Instant Analyst* calls this feature Smart Colors), you access the *Instant Analyst* menu and select the Define Test option. You're then prompted to enter the range of cells you want to analyze, the operation (for instance, >, =, or <) to apply to each cell in the range, the cell or range of cells containing the data to compare against, and, of course, the color of the cell if it meets the criteria you defined. You can define up to eight different Smart Color tests within one spreadsheet.

Instant Analyst provides up to 16 different color options, including 8 that blink. If you have a monochrome graphics monitor, your options include reverse video, different levels of shading, and blinking cells. However, because it is difficult to distinguish between the different shading levels, you may only feel comfortable including up to six different color options in your spreadsheet.

RATIO ANALYSIS

Ratio analysis, the other main feature of *Instant Analyst*, provides a simplified menu-driven approach to calculating ratios within your spreadsheet. Ratios provide an effective means of identifying relationships between data and the trends associated with those relationships. To create a ratio using *Instant Analyst*, you specify the cell or range of cells as the divisor, and the cell or range of cells as the numerator. In *Instant Analyst* vernacular,

FACT FILE

**Instant Analyst,
Version 1.0**

Personics Corp., 63
Great Rd., Maynard,
MA 01754; 508-897-
1575.

List Price: \$69.95.

Requires: 41K RAM,
DOS 2.0 or later.

In Short: *Instant Analyst* spots trends and exception conditions within your spreadsheet data. Though it's not a full trend-analysis package (no statistical or regression capabilities are provided), it offers a menu-driven approach to setting up ratios and lets you highlight exception conditions by displaying those cells in different colors.



CIRCLE 621 ON READER SERVICE CARD

this is the analysis range. Your analysis range numbers are temporarily replaced with the calculated ratios. Typing T will toggle back to your original numbers. If you want to save these ratios or view the ratios alongside the original figures, you can copy the calculations to another portion of your spreadsheet.

If you're a proficient 1-2-3 user, calculating ratios is a relatively simple task, and you may find the ratio analysis feature slows you down. However, it may come in handy to those less proficient with 1-2-3 who want to avoid formulas at all costs.

This is not the product for you if you're looking for a meat-and-potatoes financial analysis or trend analysis package. But if you need an inexpensive, easy-to-use tool to highlight trends and exception conditions in your 1-2-3 data, you should consider *Instant Analyst*.

ABC COMPANY		
PROVISIONAL FINANCIAL STATEMENT		
	Budget	Actual
REVENUE: Total Sales	1,100,000	1,200,000
EXPENSES: Salaries - Management	350,000	280,000
Salaries - Sales	370,000	410,000
Salaries - Clerical	130,000	155,000
Rent	65,000	65,000
Professional Services	40,000	25,000
Utilities	10,000	10,500
Travel and Entertainment	5,500	6,700
Office Supplies	2,000	3,000
Automobile Expenses	6,500	8,700
Taxes Due	7,000	5,600
	1,014,000	1,036,300
NET INCOME (LOSS)	86,000	163,700

The Smart Colors feature in *Instant Analyst* displays cells in specific colors if the data in the cells meets the criteria you have defined. This example displays in red all expenses that exceed budget by more than 20 percent; expenses falling under budget are displayed in blue.

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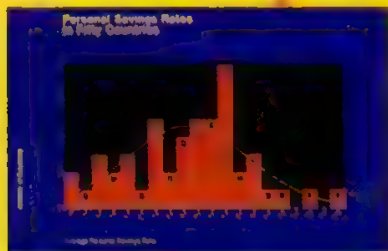
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you can better evaluate the
risks of business
decisions.

FORECASTING ADD-INS:

Garbage In, Gospel Out

by Jack McGrath

There are only three basic forecasting methods: magic, hope, and mathematics. All three generate similar forecasts, which are basically wrong. Some are more wrong than others, but only mathematically based forecasts are suited to computerization. That doesn't make them any better than forecasts produced in other ways, only more defensible.

Three of the four forecasting add-ins we evaluate in this story—*ForeCalc*, *Tomorrow*,

and *TrendSetter Expert*—are for time-series forecasts. They produce forecasts that are extensions of the past and useful for forecasting such basic business needs as budgets, cash flow, profit, and inventory. If you have to build a forecast that assumes the future will resemble the past, then you should consider these packages.

All three time-series add-ins reviewed here use exponential smoothing, an averaging tech-



PHOTOGRAPHY: WALTER CHRZYŃSKI / ILLUSTRATION: KEITH LO BLUE / CONSTRUCTION: CLAUDIA TELLER



The possibility of forecasting the future is exciting, and being able to do it easily with a *Lotus 1-2-3* add-in makes the idea even more appealing. You should, however, approach forecasting with a solid understanding of your problem, what these packages can tell you, and how reliable the results will be.

Of the four packages evaluated in this category, *ForeCalc* offers the best combination of forecast control, flexibility, and ease of use—all features that will satisfy both the experienced hand and the newcomer. An honorable mention goes to *@RISK*, a modeling language that lets you start from scratch with no historical data and build statistical forecasts and simulations.

Keep in mind, though, that the only way to judge the accuracy of your forecast is to wait and see what actually happens.

nique in which greater weight is given to more-recent data. In exponential smoothing, the weight—one or more so-called smoothing constants—is applied and re-applied to the data, with the effect of smoothing out the differences between data points. It's a technique that's relatively easy to implement in *Lotus 1-2-3*, though problems can arise dealing with seasonality and finding good values to use as smoothing constants.

The fourth add-in, *@RISK*, is a statistical forecaster that builds forecasts based on the probabilities of events, not from past history. Probabilistic forecasts are useful when you have no historical data, as when you launch a new product or when you measure the impact of a competitive strategy. They are also useful to examine dependency relationships, as when the selling price of a product will affect demand.

With the exception of *@RISK*, most of the work that these add-ins do is within the reach of a mathematically inclined, mildly macromaniacal user with the know-how to push *1-2-3* beyond traditional spreadsheet tasks. These add-ins do the work for you so you can know the risks before you take them.

@RISK

by Jack McGrath

How could you have forecasted Cabbage Patch doll sales the year they first hit the toy stores? How about forecasting the revenue you might realize by striking oil on your lease even before you drill? Such cases present you with little or no historical data to extend into the future, so techniques like exponential smoothing and regression are useless. Forecasts that deal with uncertainty require you to deal with probabilities, and if you want to do that in *Lotus 1-2-3*, you need Palisade Corp.'s *@RISK*. At \$395, *@RISK* is not a beginner's package, but if you consider yourself a *1-2-3* modeler, give *@RISK* a serious look.

When you use *@RISK*, it is not enough to know how to generate a template that lends itself to a probability-based forecast. You should know how to interpret the results as well. One popular use of a program like *@RISK* is to run Monte Carlo simulations of net present values, a technique commonly used to evaluate alternative investment opportunities. (The *@RISK* tutorial centers on such a template, though it runs a different kind of simulation called a Latin Hypercube Sampling.) The results are always impressive and invariably difficult to interpret.

DISTRIBUTION FUNCTIONS

There's a difference between building a forecasting template in *1-2-3* and building one to use with *@RISK*. Instead of typing



@RISK,

Version 1.55

Palisade Corp.,
31 Decker Rd.,
Newfield, NY 14867;
800-432-7475, 607-
277-8000.

List Price: \$395.

Requires: 512K
RAM, DOS 2.0 or
later.

In Short: *@RISK*, a statistical forecasting tool, is for those who are at home with the details of probability distributions. The package can make your life simpler, especially if you have to build a forecast from little or no historical data.

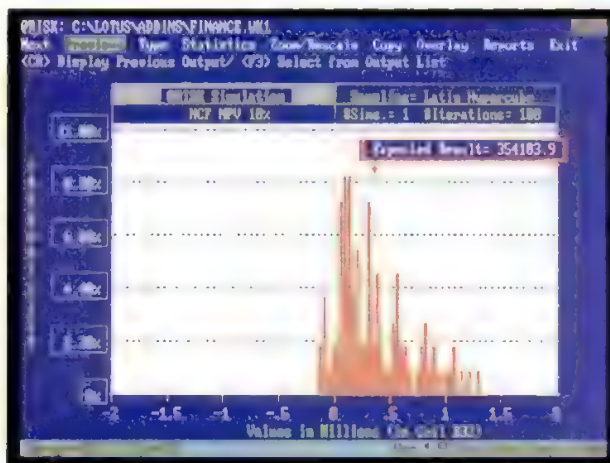


CIRCLE 406 ON READER SERVICE CARD

a series of values in a cell containing an uncertain variable (unit sales of a new product, for example), you let *@RISK* determine the value for the cell by using one of its probability distribution functions.

With *1-2-3*, if you estimate that unit sales could be as low as 1,000 or as high as 2,000, but would most likely be 1,400, you just plug in one of the three values and record the results. With *@RISK* attached, you might replace the single value with an *@TRIANG* function like this: *@TRIANG(1000,1400,2000)*.

On the other hand, you might want to use a normal distribution with mean sales of 1,400 units and a standard deviation of 300 units. Here you would use the *@NORM* function, as in *@NORM(1400,300)*. *@RISK* contains 30 such distribution functions, including Beta, Poisson, Normal, Erlang, Hypergeometric, and Pareto.



@RISK's own graphics program generates all the standard statistical forecasting graph types, such as the probability distribution graph shown here. You can access the actual data series used from within the graphics program.

Once you define all such uncertain cells in the template and use the appropriate distribution function, you would invoke *@RISK* and run a simulation. You can run as many as 25 simulations, each with as many as 32,767 iterations. Each iteration selects values from the distributions used in the uncertain cells and recalculates the worksheet using those values for the cells. When the simulation is complete, you can write the results in an area of the worksheet and view them graphically.

A GRAPHICS PROGRAM

@RISK does not use 1-2-3's graphics. When you want to view the graphs, *@RISK* closes 1-2-3 and runs RGRAPH, its own graphics program, which generates the kinds of standard graphs that statistical forecasts generally require—bar graphs of the distribution of each iteration, a cumulative curve of the distribution, and a summary distribution graph. Though complete, *@RISK*'s graphics capabilities are wanting. If you have a CGA monitor, you won't notice, but on an EGA or VGA monitor the graphs are grainy. You can, however, export them to Lotus Printgraph for printing.

Of all the forecasters evaluated here, *@RISK* comes with the largest manual—250 pages. That's not surprising, since *@RISK* is more a modeling language than an add-in that automates processes that could be duplicated in 1-2-3.

@RISK is a product for the forecaster who wants to build a model from scratch. If you're not sure about what you're doing and the thought of such techniques makes you sweat, *@RISK*'s documentation can help guide you through the procedures, but it's not a package for the uninitiated.

ForeCalc

by Jack McGrath

Business Forecast Systems' \$149 entry in the add-in forecaster market is a winner, generating impressive results on our tests. *ForeCalc* offers a significant degree of control and flexibility over the forecast without sacrificing simplicity. Unlike *Tomorrow* and *TrendSetter*, *ForeCalc* provides nine forecasting methods.

CHOOSING FORECAST PROFILES

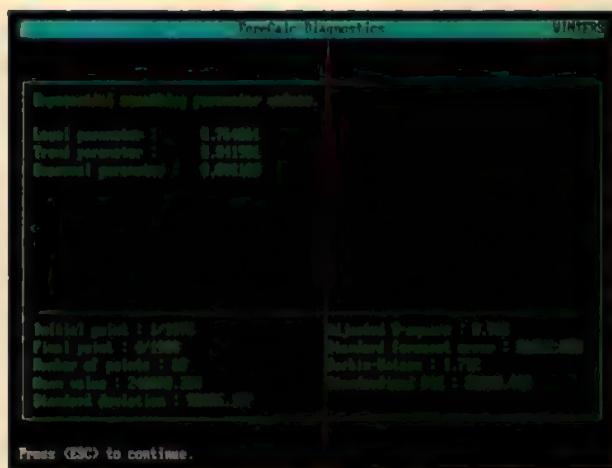
ForeCalc enables you to use such standard techniques as simple one-parameter, Holt two-parameter, and Winters three-parameter exponential smoothing. It also

lets you define up to six custom methods by selecting the treatment of trend and season in a forecast. Choices include no trend, level trend, or damped trend, and no seasonality, multiplicative, and additive seasonality.

If all those choices seem overwhelm-

Like *TrendSetter*, *ForeCalc* produces a graph of the forecast by writing graphing values to a range and generating some macro code. *ForeCalc*'s least attractive feature is the way it writes values on the worksheet. It uses the global format settings of the worksheet, rather than the local formats of the data itself.

For example, if you define a data series



ForeCalc's clean diagnostic screen presents values for the basic parameters used in the forecast, as well as statistics to measure the accuracy of the forecast method used.

ing, the *ForeCalc* documentation shows the forecast profiles of each of the methods. This makes choosing among them a simple matter of knowing which combination appears to fit your data. While this takes experience, you can also have the program select a method automatically. In this case, *ForeCalc* will make several passes at the data, testing various methods. When it finds one that seems to fit best, it generates the forecast and presents you with a screen that shows the forecasting method used, the upper and lower confidence limits of the forecast, and the forecast itself by period.

that is formatted to display two decimal places and choose to locate the forecast at the end of the data, the newly added data will not be formatted to display two decimal places unless that is the global format. *ForeCalc* does not add labels to identify the periods included in the forecast, as *Tomorrow* and *TrendSetter* do. The diagnostics report is also a bit crowded. Unlike *TrendSetter*, which writes the forecast data, confidence limits, and the diagnostics on the same screen, *ForeCalc* permits you to write the various elements of the forecast wherever you want.

DIAGNOSTICS REPORT

This diagnostics report is a menu option that includes a set of standard statistics such as the mean, standard deviation, adjusted R-square, and standard forecast error of the data. Also included are the useful, less widely implemented statistics like Durbin-Watson and standardized BIC (Bayes Information Criteria), which measures the accuracy of the forecast method. You can write all of the diagnostics to your worksheet to support the forecast.

ForeCalc will use formulas as the data, so you can generate a forecast on summary data. If values are missing for any data points, you must interpolate a value for the missing point. Consequently, if



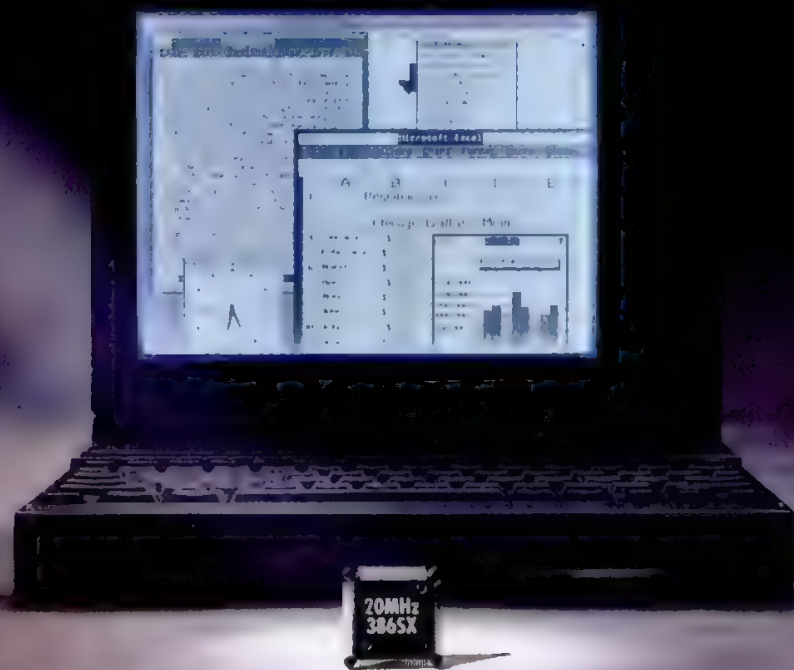
ForeCalc,
Version 1.03
Business Forecast
Systems Inc., 68
Leonard St.,
Belmont, MA 02178;
617-484-5050.
List Price: \$149.
Requires: 512K
RAM, DOS 2.0 or
later.



In Short: *ForeCalc* is a well-designed, flexible, and useful forecaster. If you want control over the elements in your forecasts, this is the add-in you should be using.

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**TEXAS
INSTRUMENTS**

COVER STORY

LOTUS 1-2-3 ADD-INS

you must regularly produce a forecast from spotty data, *ForeCalc* may not be the product for you.

Like the other forecasting add-ins, *ForeCalc* will prompt you for a confirmation when you want to overwrite a range that is not empty. If you confirm the overwrite, *ForeCalc* will do it, unless the range is protected. In this case, *ForeCalc* returns you to the menu without overwriting. It's a safer, more conservative procedure that borders on overkill. Since *ForeCalc* does not contain an undo feature, it's understandable that the program won't write to a protected range. But with *Lotus 1-2-3* Release 2.2's undo feature, this level of user-proofing is probably unnecessary.

As a Forecaster with exponential smoothing, *ForeCalc* is an excellent package for the newcomer as well as the experienced hand. The documentation, short though it may be, is clear and complete. If you need to develop a time series forecast that's quick, accurate, and easy to use—and you don't mind having to reformat and label a few things—put *ForeCalc* on your software buy list.

Tomorrow

by Jack McGrath

Tomorrow is the easiest of the four forecasting add-ins reviewed, but there is no such thing as a reliable forecast just a keystroke away. It's a good package that will generate a forecast, but it's designed to protect the user from the mathematical basis of the process. You may find this a drawback when you're asked to defend or explain your forecast. Isogon Corp., a PC and mainframe software developer, sells *Tomorrow* for \$129.95.

AN ARSENAL OF TECHNIQUES

Though *Tomorrow* uses many of the techniques that *ForeCalc* and *TrendSetter Expert* use, this program entirely isolates you from the techniques. You feed the historical data into one end of *Tomorrow* and the program cranks out a forecast from the other end. The 40-page documentation is brief but complete. The only technical forecasting term used in the manual or on-screen is MAPE (for Mean Absolute Percentage Error).

According to Isogon, *Tomorrow* uses an optimized combination of forecasts. This includes linear regression and half a dozen of the standard flavors of expo-

ponential smoothing: single smoothing, adaptive-rate-response single smoothing, Brown's one-parameter double smoothing, Holt's two-parameter smoothing, Brown's one-parameter triple smoothing, and Gardner's three-parameter damped trend. Even though all you'll see is the



FACT FILE

Tomorrow,
Version 1.00
Isogon Corp., 330
Seventh Ave., New
York, NY 10001;
212-967-2424.

List Price: \$129.95.
Requires: 55K RAM,
DOS 2.0 or later.

In Short: *Tomorrow* allows you little control over the forecasting methods you use. It does the job, but if you need tight control over the construction of your forecasts, you'll be disappointed.



CIRCLE 467 ON READER SERVICE CARD

output, that's an impressive arsenal.

Tomorrow's menu-driven interface simplifies forecast preparation. All you really need is the budget template in which you have entered actual data. If you include a set of labels identifying the data, *Tomorrow* will use those labels in the forecast output, a nice touch that the other packages lack. If you include summary formulas in the data, *Tomorrow* will replicate those formulas in the output. In effect, *Tomorrow* clones the portion of the template that you have defined as the source of the data. The range you define for the forecast will contain a replica of

the formulas, labels, and formats that are included in the input range, as well as a set of values representing the forecasted values.

If you define an output range that includes protected cells or cells that contain values or data, *Tomorrow* asks you to confirm overwrite of the ranges. Say yes and *Tomorrow* will write the forecast to a protected range. If you want to undo the overwrite to restore the contents of the range, you can do so from the *Tomorrow* menu.

The ability to include formulas in the ranges that will be used as data and generate new formulas in the forecast has a downside: The data cells must be all values, not formulas. If the cells containing the data you want to forecast are summary values that comprise a number of other addresses, you will either have to apply the forecast to the underlying cells or copy the formulas to another part of the worksheet with the Range Value command.

An improved package would permit you to use formulas as data by using the evaluated contents of cells. The problem is that when Isogon chose to replicate formulas included in the data set, they locked themselves out of using formulas. Unfortunately, *Tomorrow* is not capable of generating any graphs. If you want them, and most users do, you have to build them yourself using *1-2-3*'s Graph menu.

REALITY CHECK

Isogon describes *Tomorrow* as a product for the person who doesn't need to understand statistics but wants to predict the future. That's not unreasonable, but it's not necessarily a good idea. *Tomorrow*

1990 QUES (\$1000)	
A	B
Co	74.2
Co	177.3
Fi	36.0
Co	45.6
To	330.1
Seasonality	
Seasonality	
Seasonality	
Cost of materials	83.5
Cost of labor	191.8
Fixed costs	36.8
Cost of sales	52.7
Total costs	322.3

As *Tomorrow*'s settings screen shows, you can control only one part of the forecast: seasonality. All the remaining settings deal with the worksheet.

won't explain the forecast or tell you how to improve it. The only control you can exercise over the forecast is in choosing to calculate seasonality automatically or manually and indicating the number of data points to include in a year: four for quarterly, twelve for monthly, and so on.

While *Tomorrow* is technically proficient and simple to use, it's also inflexible. Be prepared for a reality check if you make a critical business decision based on its output. If you run a small business and want to get a loose handle on next year's or next month's sales figures but you don't want to wade through a morass of details, then you will get your money's worth from *Tomorrow*.

TrendSetter Expert

by Jack McGrath

TrendSetter Expert from Concentric Data Systems uses what it calls "proprietary expert systems logic" to produce a single forecast from four techniques. While the \$149 package does not offer any control over the forecasting techniques, it does produce a report that includes statistical information you can use to refine and improve forecasts.

TrendSetter Expert is a hybrid add-in. That is, before you can attach it to *Lotus 1-2-3*, you must run one of a pair of memory-resident modules that come with the program. Which one you run depends on whether you have a math coprocessor installed. The menu-driven package uses a form to set up a forecast. You can define up to a dozen ranges as data, and you can view and edit all settings concerning a forecast on a single screen.



DIAGNOSTIC REPORTS

After you run a forecast, *TrendSetter Expert* will write the results and a diagnostic report directly on the worksheet. The data can contain formulas, so you can use summary data. However, *TrendSetter Expert* does not generate new formulas as *Tomorrow* can. It handles intermittent data, and you can include zero as an actual value. If your data includes too many zeros, the program will not analyze any seasonality in the data, although it will still produce a forecast.

TrendSetter Expert uses four forecasts: single exponential smoothing, double smoothing, a regression of the entire series, and a regression on the last full season in the series. *TrendSetter Expert*'s diagnostics include several statistics that allow you to refine or improve your forecasts. For example, even though you define a season as 12 periods (monthly seasonality) the program may report that there's a different seasonal pattern in the data. If the forecast looks off the mark, you can try running another at one of the seasonalities suggested by the program.

SEASONALITY PATTERNS

We tested all three time-series add-ins with a data series consisting of an unusual set of quarterly values. Only *ForeCalc* produced results very close to those produced manually (in that you would generate a forecast based on a set of mathematical formulas, not on an add-in's series of menu options), without using a forecaster.

TrendSetter Expert's forecast was a long way off the mark, as was *Tomorrow*'s. The problem in both cases turned

out to be that we let the programs identify seasonality automatically. *TrendSetter Expert* identified a season of around 30 periods and reported that other possible seasonal patterns existed in the data. When seasonality was set manually to four periods per year, both *TrendSetter Expert* and *Tomorrow* produced forecasts that more closely resembled *ForeCalc*'s and our manually produced forecast.

To its credit, *TrendSetter Expert* reported on the seasonality it used, and that's what made it possible to solve the problem and generate a more accurate forecast. *Tomorrow*'s scant diagnostics gave no hint of the problem.

A unique feature missing from *ForeCalc* and *Tomorrow* is *TrendSetter Expert*'s ability to generate a seasonal index (called seasonal factors) for each period in the forecast. Whenever you have to produce a quick and dirty forecast, having a set of seasonal indexes available is handy.

TrendSetter Expert's documentation is cleanly designed and clearly written. The chapters on improving forecasts and forecasting techniques are especially well done. One minor concern with the documentation is that it ends with a paragraph advising that the real test of forecast accuracy is waiting to see how close your forecast is to reality. That paragraph is too important to be buried in the back.

While *TrendSetter Expert* has many advantages, especially for dealing with intermittent data, you have no control over the forecasting method used. Comparatively, you get much more information from this forecast than from *Tomorrow*'s, and you'll be satisfied with the techniques and the implementation.



FACT FILE

TrendSetter Expert, Version 1.0

Concentric Data Systems Inc., 110 Turnpike Rd., Westboro, MA 01581; 508-366-1122.

List Price: \$149.

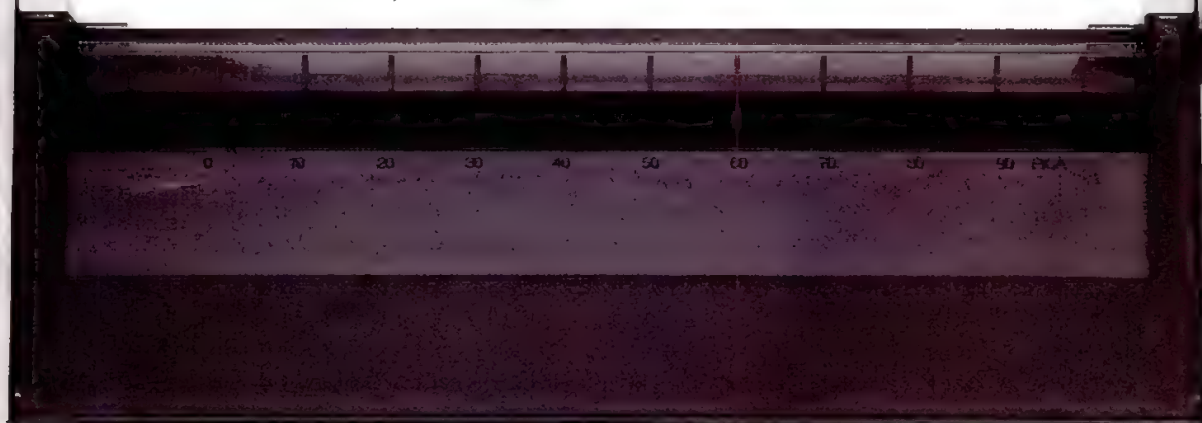
Requires: 170K RAM, DOS 2.0 or later.

In Short: If you have to produce a time-series forecast from an intermittent data set or calculate seasonal indexes, *TrendSetter Expert* fits your needs. Despite excellent documentation, it gives you little control over the design of your forecasts.



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* Based on US dollar market share of competitive models for the 12 months ending December, 1990, as reported by InfoCorp (1/91)

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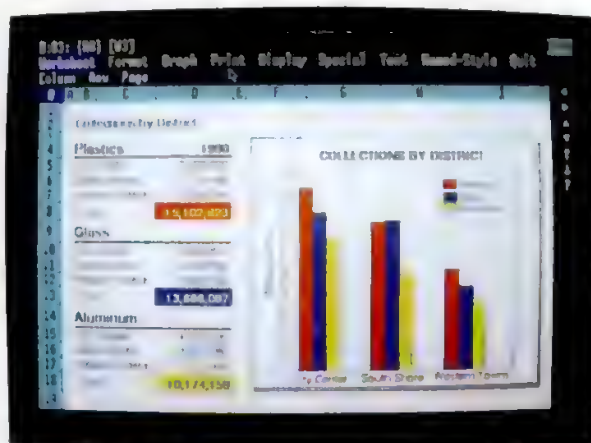


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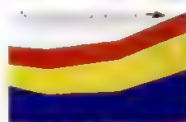


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MATERIAL COLLECTION



Q1	Q2	Q3	Q4
1,930,762	1,982,054	2,370,857	2,894,088
1,700,504	1,682,135	1,889,432	2,800,894
1,146,884	1,142,022	1,468,421	1,551,783
4,778,150	4,806,211	5,728,710	7,246,765

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Only Release 3.1 lets you automatically wrap text around a graph.

Revenue by Product

Last year was a good year for the company. WeCycle was profitable and came very close to achieving our goal in a very uncertain economic and recycling climate.

Revenue by Product

Material collection increased over the year. Plastics continue to bring in the most material and profit for the company. Prices for aluminum are still very soft and while we are continuing to collect more glass, markets for the raw materials are still in their infancy.

Revenue	Q1	Q2	Q3	Q4	1990
Plastics	1,930,762	1,982,054	2,370,857	2,894,088	9,187,761
Glass	1,700,504	1,682,135	1,889,432	2,800,894	8,072,965
Aluminum	1,146,884	1,142,022	1,468,421	1,551,783	5,429,090
Total	4,778,150	4,806,211	5,728,710	7,246,765	26,837,606

The graph at the right details our material by waste material for the four quarters of 1990. The revenue increases show that collection rates are building, new recycling programs beyond just collecting plastics. Revenue from aluminum and glass have increased to their programs. Two good volume but, we're still waiting price pressure for the bulk of recyclable materials continues to be in the market. We want to see for ways to expand our business and increase the use of recycled materials.

Collections by District

Plastics	Q1	Q2	Q3	Q4
Central	1,930,762	1,982,054	2,370,857	2,894,088
South Shore	1,700,504	1,682,135	1,889,432	2,800,894
Providence	1,146,884	1,142,022	1,468,421	1,551,783
Total	4,778,150	4,806,211	5,728,710	7,246,765

Below the table is a 3D bar chart titled 'COLLECTIONS BY DISTRICT' showing data for 'Central', 'South Shore', and 'Providence' districts across four quarters.

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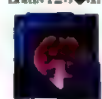
And now, when you buy Release 3.1 between January 8,

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Lotus 1-2-3 3.1

Lotus 1-2-3 3.1



Add linear programming,
optimizing, backsolving, and goal
seeking to your spreadsheet
vocabulary with these advanced
problem-solvers.

OPTIMIZING ADD-INS:

The Educated Guess

by John C. Nash

What mix of products should you produce to yield the highest profit? What engine control settings use the least fuel? Your basic spreadsheet can't give you answers to these resource allocation problems, which are also known as goalseeking or optimization problems, but there are a few ways to solve them. You can brush up on simultaneous equations and iterative recalculation, you can use *Lotus 1-2-3/G's* Solver and Backsolver functions (which run under OS/2), or you can use *1-2-3* optimization add-ins.

Each of these methods uses linear or nonlinear programming techniques or nonlinear-equation solving methods. We tested *What-If*

Analyst, *What-If Solver*, and *What'sBest!*, requiring each package to solve nonlinear equations (such as sales needed for profit), to minimize or maximize nonlinear functions with a few constraints (often involving scientific or engineering problems), and to optimize a linear objective function subject to a large number of linear constraints (as in determining proportions of animal feed to ensure the proper amounts of protein and carbohydrates).

The comparison reveals what the packages can and can't do, but it also gives insight into the complexity of optimizing software. By design or by mistake, it's easy to create difficult problems that trip the software. You should have a good



PHOTOGRAPHY: WALTER CHRZYŃSKI / ILLUSTRATION: KEITH LO BUE / CONSTRUCTION: CLAUDIA TELLER



EDITORS' CHOICE

• What-If Solver

All three of the packages reviewed here are technically stable, but for wide-range problem-solving flexibility, the choice is *What-If Solver*. It's easy to invoke and use, and it will attempt to optimize complicated functions and constraints of a number of variables.

If linear programming is your game, however, you will not want to ignore *What'sBest!*, a reliable choice for this specialty.

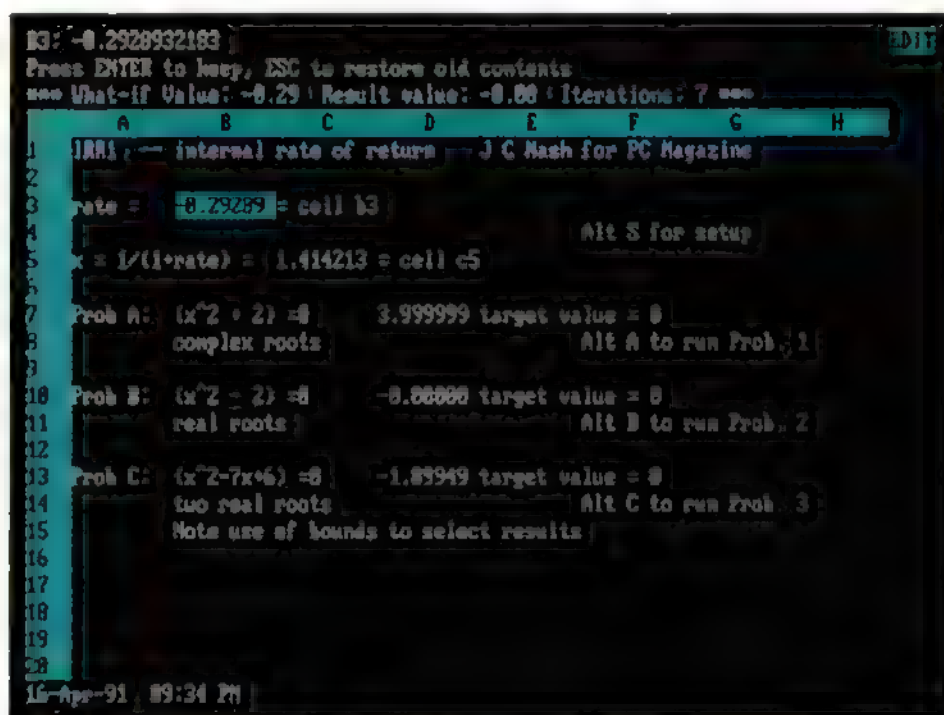
understanding of your optimization problem and be prepared to spend time checking the accuracy of the results.

What-If Analyst

by John C. Nash

What-If Analyst, \$49.95 from Frontline Systems, can help minimize the error in trial-and-error work. While a reliable and efficient rootfinder can be written in a few lines of conventional programming code or in the Lotus macro language, *What-If Analyst*, which works with 1-2-3, Release 2.x and Release 3, does the work for you. It finds the root of a single nonlinear equation—one equation in one unknown, meaning there is one variable to solve to satisfy the equation. The \$99.95 *Premium Edition* solves several simultaneous nonlinear equations; that is, ten equations in ten unknowns.

Computing an internal rate of return, *What-If Analyst* automates a function otherwise programmed in code or in the Lotus macro language.



Many real-world problems can be formulated as nonlinear equations, including the internal rate of return on investments (@IRR in 1-2-3), the premium for an insurance policy given the probabilities of losses, or the sales necessary to achieve a given level of profit. There are also a number of scientific and engineering problems that can be formulated this way.

GOAL SEEKER

Both versions of *What-If Analyst* have a simple interface. You define the "what if" cells that are the variables in the nonlinear equations, then define the "result" or goal cells that compute each equation, and finally the "target" or right-hand side of each equation. A Go command sets the add-in to work to solve the equations.

For *What-If Analyst*, there can be just one "what if" cell and one "result" cell. Unlike the *Premium Edition*, there is an option to set lower and upper bounds for the "what if" cell. This feature is important if more than one solution exists, as in an internal rate of return problem.

Other options allow the user to control how quickly the search for a solution is stopped by setting limits on the number of iterations or the "precision" for relative change in one or more variables. Such controls and the use of bounds are not for the novice, yet there are many problems where they must be employed to obtain an accurate result.

PREMIUM EDITION

The manuals for both versions of *What-If Analyst* are short, clear, and straightforward, though limited in problem formula-

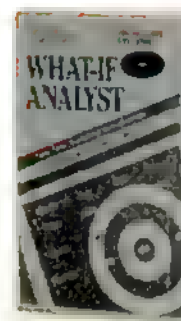


FACT FILE

What-If Analyst, Version 1.1
Frontline Systems Inc., 124 University Ave., #101, Palo Alto, CA 94301; 800-451-0303 ext. 55, 415-329-6877.
List Price: \$49.95; Premium Edition, \$99.95.

Requires: 40K RAM (60K RAM for Premium Edition), DOS 2.0 or later.

In Short: *What-If Analyst* is a straightforward tool for solving a wide class of nonlinear equations such as return on investments and goal-seeking problems. It's easy to use and modestly priced.



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tion and hints to ensure reliable use of the programs. There is just one example worksheet for the regular version and four for the *Premium Edition* (two of which show how to use macros with the product). The limits on the number of variables and equations (actually 10 of each) for the *Premium Edition* are buried deep in Chapter 5 of the manual.

What-If Analyst and *Premium Edition* are different in several ways. The *Premium Edition* does not let you set bounds on variables, but it does claim to let you minimize functions and solve for nonlinear least-squares problems. We found, however, that the minimization algorithm in the *Premium Edition* was not up to a difficult test problem with five variables. Using various starting values for the variables, *What-If Analyst* required many iterations (in one case it stopped at 1,000). For a set of starting values, which are at a "saddle point," it returned ERR in the working cells.

While the *Premium Edition* solves larger problems, it does not add enough value in the sophistication of the algorithms to justify the extra cost. If you need to solve return-on-investment, sales-needed-for-profit, or similar problems with a single variable, the basic version of *What-If Analyst* is a reasonable value, especially if you do not program or write macros.

What-If Solver

by John C. Nash

If you covet the analytic capabilities of 1-2-3/G but have no plans to move to OS/2, then *What-If Solver* may be your

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spreadsheet's best friend. This \$199.95 add-in from Frontline Systems solves linear problems and finds the minimum or maximum of a nonlinear function of up to 40 variables with up to 20 constraint conditions. In addition, the variables may be restricted to occur between upper and lower bounds.

Example worksheets show you how *What-If Solver* can help you choose an efficient investment portfolio, maximize interest income, allocate advertising dollars, and minimize payroll costs.

Following the straightforward installation procedures, you can have *What-If Solver* running smoothly in about half an hour. A few keystrokes set an optimization in progress, and the simple-to-use features save and load problem information. For the more advanced user, there are choices of settings for convergence control and adjustment of the method, but these are configured so that they don't become an obstacle for the novice.

PERFORMANCE TESTS

To test the performance of the optimizer, we created a Genrose problem, which is a common test of nonlinear optimization software. In setting up the problem, and particularly in building macros to run it for different numbers of parameters, we encountered a minor obstacle where *What-If Solver* simply beeped and displayed an "ERROR" message with the explanation "Break," even though we had not touched the keyboard. This disappeared when we fixed errors made in specifying the problem, but we could not reliably duplicate the conditions giving rise to the "Break"

error. This suggests that some variable was not always initialized properly in our worksheet, 1-2-3, or *What-If Solver*.

A sample linear-programming problem for formulating a least-cost animal feed (an example supplied with *What'sBest!*) was solved quickly and correctly. On the other hand, adding some simple constraints to the Genrose problem caused the *Solver* to stop in several cases with the constraints unsatisfied. You may prefer optimization software that tries a little harder to find feasible points, even if they are not optimal.

Execution timings are quite respectable, running only slightly slower than for a compiled BASIC program.

DIAGNOSTICS DILEMMA

Nonlinear optimization can be a troublesome task, and *What-If Solver* lacks diagnostics that may help to identify the problem. It is quite easy to provide functions and constraints for which there are no solutions at all. Some constraints— $B(1) < 1$ and $B(1) > 3$, for example—cannot be simultaneously satisfied. The inconsistency here is obvious, but similar situations may be quite difficult to detect.

For the software developer, providing diagnostic information is a serious and perhaps impossible chore. Nevertheless, new users need some sort of suggestion as to what may be ailing the problem defined in their worksheet. In this capacity, *What-If Solver* may disappoint you.

The manual is quite short and to the point, including good explanations of the optimization process as well as adequate installation and operation instructions. A

Solving both linear and nonlinear problems, *What-If Solver* can find the most efficient allocation of limited resources. Here it's finding the least-cost formulation of animal feed.

C17: (F2) U (M) 200
Minimum value found: 19250.000000 from 19250 to 19250, SEC to discard
Trial Solution: 4

Item	Constraints For Unit Weight of:				Minimum Required	Surplus	Unit Value
	Grain 1	Grain 2	Grain 3	Grain 4			
Nutrient A	2	3	7	1	1250	0.00	\$0.00
Nutrient B	1	1	4	3	250	0.00	\$0.00
Nutrient C	5	2	8	1	900	250.00	\$0.00
Nutrient D	0.5	0.25	1	1	222.5	0.00	\$0.00

Cost Per Unit Weight	\$11.00	\$25.00	\$35.00	\$100.00
Weight Units To Purchase	20.00	100.00	0.00	0.00
Total Cost	\$220.00	\$2500.00	\$0.00	\$0.00

16-Apr-91 09:44 PM



What-If Solver,
Version 1.1
Frontline Systems
Inc., 124 University
Ave., #101, Palo
Alto, CA 94301; 800-
451-0303 ext. 55,
415-329-6877.
List Price: \$199.95.
Requires: 512K
RAM, DOS 2.0 or
later.



In Short: *What-If Solver* is a good nonlinear optimization tool for modest problems with 2 to 25 variables and fewer than 20 constraints. The package is easy to use, but the problems it handles can often be very difficult to solve by any method, so users need to understand the tasks they are trying to accomplish.

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minor fault: The critical limits on number of variables and constraints are buried in Chapter 5.

Overall, *What-If Solver* is a useful tool for solving modest-sized optimization problems with 2 to 25 variables. Given the difficulties of nonlinear optimization, it should be used with care. Since problems can be defined and run via macros that invoke *What-If Solver*, some of the tests and precautions necessary could be provided by expert users in the form of macro code. The resulting spreadsheet templates could then serve a wide class of users in an organization.

What'sBest!

by John C. Nash

What'sBest!, Personal Version 1.5, \$149 from Lindo Systems, solves linear programming problems in a *Lotus 1-2-3* environment. *PC Magazine* recognized the software as one of the best packages of 1986, calling it a "linear-programming power-to-the-people" tool. Lindo Systems offers five versions of the package, ranging in price from \$149 for the Personal Version that handles 400 variables to the \$4,995 Extended Version that handles 32,000 variables.

By swapping 1-2-3 out of memory during solutions and back in to display results, *What'sBest!* allows you to work with relatively large models. In our admittedly small tests, the swap mechanism worked smoothly once *What'sBest!* was correctly installed. Yet the package is not nearly as easy to set up and use as the Frontline packages.



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TACKLING LINEAR PROBLEMS

What'sBest! allows 400 variables and 200 constraints in a maximum of 800 numeric cells. You can declare 40 binary variables to handle integer (whole number) situations, such as the decision to have or not have a facility built at a given location. This is a useful feature and a reasonable alternative to general mixed-integer linear programming.

Tackling serious "can we do it better?" problems is *What'sBest!*'s forte. For example, what's the proper editorial mix of news, reviews, columns, and tips



FACT FILE

**What'sBest!,
Personal****Version 1.5**

Lindo Systems Inc.,
1415 N. Dayton
Ave., Chicago, IL
60622; 800-441-
2378, 312-871-2524.

List Price: \$149.

Requires: 256K RAM, DOS 2.0 or later.

In Short: *What'sBest!* is a linear programming add-in that is best suited for serious users who need to solve problems with large numbers of variables and constraints.



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that satisfies different groups of readers? Or what's the cheapest workshift schedule that best satisfies manpower requirements?

What'sBest! cannot be compared directly with *What-If Analyst* and *What-If Solver*. While *What'sBest!* allows you to solve large linear problems, *What-If*

117: (CR) U SUMPRODUCT(C14..F14,C17..F17) READY

Item	Grain 1	Grain 2	Grain 3	Grain 4	Nutrients Minimum Required	Surplus	Dual Value
Nutrient A	1	2	3	4	1250	0.00	\$0.00
Nutrient B	2	1	0	0	250	-0.00	\$1.00
Nutrient C	5	3	0	0	700	250.00	\$0.00
Nutrient D	0.5	0.25	1	0	232.5	-0.00	\$0.00
Cost Per Unit Weight	\$11.00	\$26.00	\$6.00	\$100.00			
Weight Units to Purchase	200.00	100.00	100.00	0.00			
Total							
Dual Values	\$0.00	\$0.00	\$0.00	\$51.00			

16 Apr 91 09:57 PM

Here *What'sBest!* solves the same limited-resource problems as *What-If Solver*. The program is available in five versions for different-size problems. The Extended Version can solve problems with up to 32,000 variables.

Solver's nonlinear capabilities allow you to handle smaller but much more general problems. Probably the best-known spreadsheet alternative to *What'sBest!* when it comes to linear programming is Borland's *Quattro Pro*.

SETUP

The thorough manual cautions you to load 1-2-3 via a special *What'sBest!* program, WB.EXE. You must also set *What'sBest!* to automatically attach every time 1-2-3 loads. This important detail is covered in Appendix C of the manual and also on page 5 of "Getting Started." Once installed, *What'sBest!* is relatively easy to use.

Much of the manual describes the setup and running of different classes of problems, such as product mix for most profit, minimum shipping cost, and staff sched-

uling. Worksheets for these examples accompany the software. The manual includes an extensive discussion of the use and interpretation of dual values to variables, as well as an approximate method for handling simple nonlinear objective functions. A special add-in @function, Sumproduct, greatly eases the task of creating objective functions and constraints.

What'sBest! capably solves linear programming problems and is not expected to perform nonlinear programming. Evolution to an equally good product for nonlinear optimization would involve a good deal of careful design and implementation. If your work lends itself to formulation as a linear problem, and you use a spreadsheet environment for much of the data handling and modeling, *What'sBest!* is the tool of choice.

WHAT GOAL-SEEKING AND OPTIMIZING ADD-INS DO

by John C. Nash

Part-time mathematicians who pick up a goal-seeking or optimizing package can soon find themselves lost in an obscure world of statistics. This group of evaluated *Lotus 1-2-3* add-ins have very specific functions. Here are some real-world examples to help you figure out which packages you need to solve the problems you have.

Frontline Systems' *What-If Analyst* and *Premium Edition* solve nonlinear equations (up to ten); for example, you already know the relationship between

sales and profits and want to know the volume of sales necessary to achieve a given profit level.

What-If Solver solves nonlinear optimization problems (possibly constrained), of which linear programs are a subcategory: The fuel efficiency of a vehicle is a known (and nonlinear) function of several variables, such as weight, tire pressure, wind resistance, fuel/air mix, gear ratio, and road type (gravel, paved). You want to know the best settings of tire pressure, fuel/air mixture, and gear ration for given settings of the other variables in

order to maximize efficiency.

What'sBest! solves linear programs, or to impress your friends, constrained optimization of a linear objective function. Here is an example: As a pet food manufacturer, you can use cereal to replace meat as long as the packaged product has the right amount (per volume or weight) of carbohydrate, protein, minerals, and vitamins. As long as these "right amount" constraints are satisfied, we can vary the amounts of meat and cereal to produce least-cost pet foods. ■

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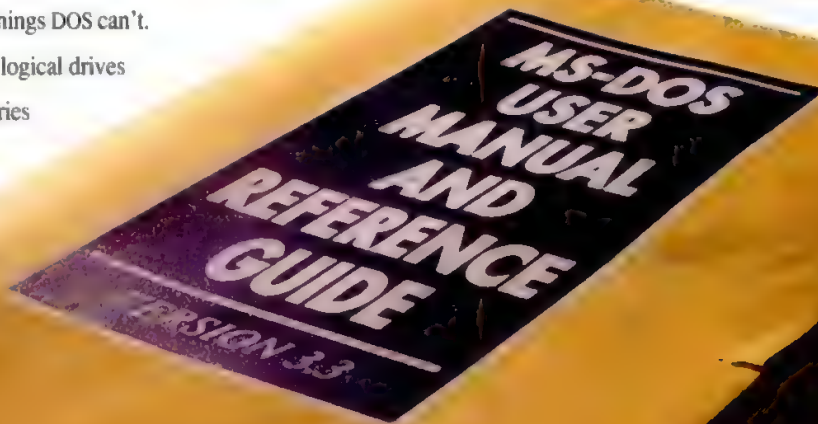
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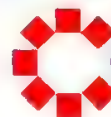
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These eight time-saving add-ins make 1-2-3 more efficient by letting you customize as much as your budget and PC memory allow.

UTILITY ADD-INS:

Something For Everyone

by Carol Levin

Rounding out *Lotus 1-2-3*, Release 2.2's function set with add-ins is one alternative to upgrading to Release 3. This diverse collection of utilities—which cover needs from improved screen viewing and macro debugging to background printing and expanded memory usage—can also save you from the headaches of spreadsheet chores. They're all helping 1-2-3 keep up with the competition.

There's broad appeal for packages that recover damaged worksheets, which we cover in the sidebar comparing *The Norton Utilities* with *Rescue Plus*, a utility specializing in 1-2-3 files. For a

look at the popular spreadsheet publishing add-ins, *Allways* and *Impress* (now bundled with 2.2 and 3.1, respectively), see "Lotus 1-2-3, Release 3.1: Graphic Improvements" (*PC Magazine*, February 12, 1991). Many others, like Spreadsheet Solutions' *@Ease* (516-222-1429), a formatting savior, are in the Lotus enhancements catalog.

Rather than comparing this multi-purpose group of add-ins for an Editors' Choice, we leave the choice to you. The winners are the ones that fit your needs. You'll find most do their job simply and well. And the best thing about them is that you can pay for them out of your aspirin budget.



PHOTOGRAPHY: WALTER CHRZYŃSKI / ILLUSTRATION: KEITH LO BUE / CONSTRUCTION: CLAUDIA TELLER

Beyond 640

by Bruce Brown

The promise of expanded memory utilization for *Lotus 1-2-3* was a cruel tease. While actual spreadsheet cell contents are held in expanded memory, *1-2-3*, Release 2.x's memory-hungry cell address records, or "pointers," must be stored in conventional memory. This is why you often see "Out of memory" error messages, even when you have free megabytes of expanded memory. Intex Solutions' *Beyond 640* solves the cell pointer problem and makes the expanded memory promise come true.

RELOCATING CELL POINTERS

When you invoke *Beyond 640*, you're asked to set a conventional memory threshold between 0 and 640K (the default is 32K), beyond which all cell pointers are stored in expanded memory. This lets you use up to 4MB of expanded memory for cell pointers and cell contents, as well as keep track of remaining conventional memory. When unused conventional memory gets down to *Beyond 640*'s threshold, all additional cell pointers are stored in expanded memory.

If you typically use RAM resident programs such as Borland's *SideKick*, *Lotus Express*, or other *1-2-3* add-ins that use conventional memory, you'll need to set a moderately high threshold. For example, if you use the popular *Always* add-in, which uses almost 100K RAM, you should set the threshold at a minimum of

100K. If you should decide to keep all cell contents and pointers in expanded memory, set the threshold to 640K. This strategy reserves all your conventional memory for DOS, TSRs, *1-2-3*, and any other add-ins you may have.

At first thought, a 640K threshold seems ideal. Depending on the physical type of expanded memory in your computer, however, you may pay a speed penalty. Expanded memory that's mounted on a memory card plugged into an 8-bit or 16-bit interface slot is slower than memory mounted directly on the motherboard. This results in slower calculating times, which becomes increasingly aggravating for larger, more-complex spreadsheets. Newer machines with all memory located on the motherboard or on special high-speed memory cards largely obviate the problem of slower expanded memory.

While you may wonder why Lotus didn't use expanded memory efficiently in the first place, the answer probably lies with the speed of expanded memory on computers then in use. If you're tired of dumping your TSRs to build a moderately sized spreadsheet, or if you consistently run out of conventional memory because of cell pointer clutter, *Beyond 640* handles both problems admirably.

Guardian

by Bruce Brown

Picture this: You're building a spreadsheet and decide to save it after an hour's work, but by mistake you hit /File Retrieve instead of /File Save. The result is one lost hour. Or this: You finish building a beautiful spreadsheet and quit *Lotus 1-2-3*, only to discover later that you never saved the file. These common user errors join power outages and flickers as culprits in irrevocable loss of *1-2-3* work.

Intex Solutions' \$95 *Guardian* add-in can prevent future losses and help safeguard spreadsheets from inadvertent human error, power loss, and equipment failure. While not invincible (*Guardian* can't do a thing for a thoroughly trashed hard disk), this versatile program makes minimal memory demands and more than pays for itself by providing automatic spreadsheet backup. *Guardian* also lets you save multiple versions of spreadsheets and archive files to save disk space.



FACT FILE

Guardian, Version 2.0
Intex Solutions Inc.,
161 Highland Ave.,
Needham, MA
02194; 617-449-6222.

List Price: \$95.

Requires: 28K RAM,
DOS 2.0 or later.

In Short: *Guardian* provides virtually foolproof spreadsheet backup to protect you from losing work by accident or power failure. You can save multiple versions of the same worksheet and use an archiving function to save old backups in alternate directories or drives. If you've lost a worksheet more than once, you need this program.

CIRCLE 416 ON READER SERVICE CARD



AUTO BACKUP AND ARCHIVE

Using *Guardian*'s simple installation procedure, you copy all the program files to your *1-2-3* directory. Each time you invoke the program, a configuration screen appears from which you select options for automatic backups and version control, and indicate whether you want the program to back up your current worksheet when you retrieve a new file.

The Auto-Save feature lets you specify intervals of time and keystrokes after which *Guardian* will back up your current worksheet. The time interval between backups can vary from 1 to 120 minutes. To back up after a specified amount of work, you can set the keystroke interval from 25 to 10,000 keystrokes. To have it both ways, you can activate the time and keystroke interval thresholds simultaneously.

While you can get carried away by choosing minimal intervals so that *Guardian* saves your spreadsheets almost all of the time, it's more reasonable to set intervals that fit your work pace. You could schedule *Guardian* to back up at 5-minute intervals for a minimal delay on a fairly fast computer. If saving by keystrokes matches your work style, you can set the interval at 100 or 200 keystrokes and then let practice tell whether to raise or lower the interval.

VERSION CONTROL

If *Guardian*'s sole purpose were automatic backup, it would be worth its price, but there are other features that are valuable tools for frequent spreadsheet users.

One of the best is the version-control



FACT FILE

Beyond 640, Version 1.02
Intex Solutions Inc.,
161 Highland Ave.,
Needham, MA
02194; 617-449-6222.

List Price: \$95.
Requires: 4K RAM,
LIM 3.2 or 4.0
expanded memory,
DOS 2.0 or later.

In Short: *Beyond 640* makes use of expanded memory by pushing file pointers out of conventional memory, enabling you to use up to 4MB of expanded memory for worksheets. If you routinely run out of workspace even though you have plenty of expanded memory available, this program provides the answer.



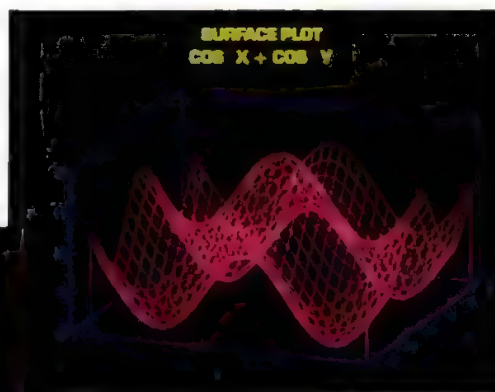
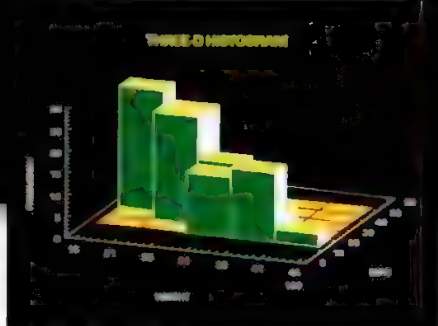
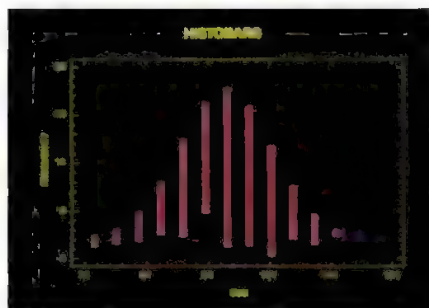
CIRCLE 415 ON READER SERVICE CARD

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SPSS™/PC+	No	No	10 meg.	\$2375*
SAS®/PC	No	No	20 meg.	\$2075*

ment lets you test ideas more quickly, analyze data more thoroughly, and uncover hidden trends.

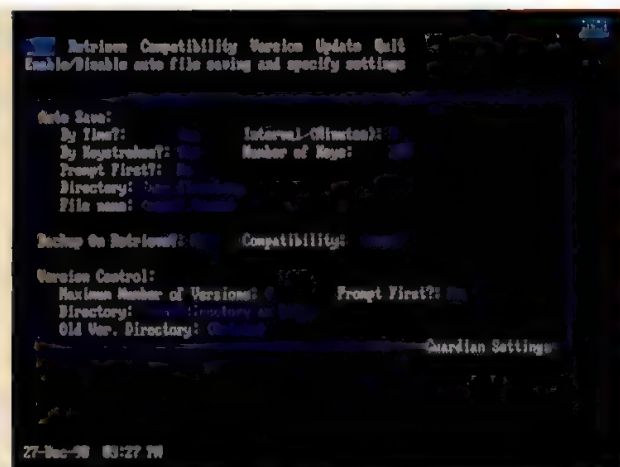
Easy To Use. Enter data using STATGRAPHICS full-screen editor.

CIRCLE 365 ON READER SERVICE CARD

STATGRAPHICS is a registered trademark of Statistical Graphics Corporation. Other trademarks are the property of their respective owners. International prices may vary. *Price includes base system plus all modules necessary to fully emulate STATGRAPHICS. Chart based on data compiled as of 8/2/89.

STSC:

STSC, Inc.
 2115 East Jefferson Street
 Rockville, MD 20852



When you invoke *Guardian*, a single set-up screen lets you select various options for backup interval, archiving, and version control.

feature, which is helpful if you rely on spreadsheets for budgeting or financial planning. This feature lets you make minor changes and save successive versions of the spreadsheet without needing to assign and keep track of different filenames yourself. You can save up to 50 successive versions of your current worksheet, with the file extensions .V00, .V01, and so on, up to the number of versions you've specified. If you exceed the specified number, *Guardian* deletes the oldest version and shifts the version numbers backward so that the last saved version has the highest version number. To keep your directories clean and to save drive space, you can specify any subdirectory or drive for saved versions.

Guardian also comes with the public-domain *Lharc* archiving program that lets you reduce file size by roughly 50 percent and save precious space for working with large spreadsheets. 26K of RAM isn't a high price to pay for the insurance *Guardian* provides. Even if you don't need the archiving capability, the automatic backup feature could make you an enthusiastic convert.

Look&Link

by J. Blake Lambert

Look&Link, a \$99.95 worksheet viewing and linking add-in from Personics, makes life inside *1-2-3* easier by combining worksheet viewing with consolidation and recalculation, and by extending Release 2.2's cell-linking capability with range linking.

It's actually three add-ins in one: *Look*

for worksheet viewing, cutting, and pasting; *Link* for consolidating and recalculating groups of worksheets; and *Linkfun* for defining connections between worksheet cells or ranges with an @functions set. Created out of real-world needs, *Look&Link* is efficiently designed and integrated with *1-2-3*.

BROWSING WORKSHEETS

Look displays the file you request at the bottom right of the screen in a window that you can move and resize. You can then swap *1-2-3*'s active worksheet and the browsed worksheet, and combine information. When you want to try your hand at linking, *Look* lets you see the cells you're connecting. This makes linking as easy as highlighting a range in *1-2-3*.

The Combine command makes it easy to copy formulas or values and to add or subtract from the browsed worksheet to the active one. The Formula command provides a menu-driven method of linking files using menu choices.

DEPENDENCY-TREE MENU

The *Link* add-in makes quick work of consolidating and recalculating sets of worksheets by allowing one spreadsheet to grab the contents of a cell or range of cells from another. *Look&Link*'s method is easier and more powerful than *1-2-3*, Release 2.2, especially when it comes to protecting you from consolidation and recalculation mistakes. It does this by providing a special dependency-tree menu for defining, clearing, saving, importing, exporting, and listing relationships between linked worksheets.

The dependency tree tells *Link* which

worksheets to sum when consolidating and what order to follow during recalculation. For example, you could define spreadsheets for compact disc, album, and tape sales as dependents or subworksheets of a music sales spreadsheet. In turn, you could define this spreadsheet as a dependent of a storewide sales sheet.

Look&Link calculates the spreadsheets at the lowest levels first; data then flows upward to the top worksheet. To visualize this hierarchy, you can create a dependency tree in an indented outline form. *Link*'s Recalc command recalculates all of the worksheets in a dependency tree. With Consolidate, you can sum the same cell or range in all worksheets on a given level and send the result to the worksheet at the next higher level.

When you load a file, *Link* lets you enter an alias for the path and filename, so you could, for example, set up STOCKS as a substitute name for the complete worksheet path and filename, C:\WK1\NETWORTHSTOCKS.WK1. This ability makes it easier to enter names into spreadsheet linking formulas.

Link speeds up its work if you load worksheets into conventional or LIM expanded memory. But if it doesn't find what it needs in memory it looks on-disk. Before recalculating or consolidating, you can unload worksheets from memory with the Worksheet Purge command. These operations use worksheets on-disk rather than worksheets in memory. *Link*'s memory command provides statistics on the amount of conventional and expanded memory in use, the amount used by each worksheet file and its pointers, and the amount available.



FACT FILE

Look&Link, Version 1.14

Personics Corp., 63 Great Rd., Maynard, MA 01754; 800-445-3311, 508-897-1575. List Price: \$99.95. Requires: 55K RAM for *Look* utility, 35K RAM for *Link* utility, DOS 2.0 or later.

In Short: *Look&Link* is a simple addition to *1-2-3* that lets you look at a worksheet without removing the current *1-2-3* worksheet. With this three-in-one add-in, you can copy, combine, and link two worksheets, as well as consolidate and recalculate sets of linked files.



CIRCLE 417 ON READER SERVICE CARD

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The Pocket LAN Adapter



Product of the Year—Portable Networking 1989
"It's the perfect way to link portables to a LAN."



Best of Show—Fall Comdex 1989

"Makes it vastly easier to connect systems—especially portables—to LANs."



Product of the Year 1989

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"Xircom delivers in the smartest, most stylish manner imaginable."



What makes our Tempo so catchy.

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Tempo 286/12c

- 80286 12MHz CPU
- Standard 1MB RAM (Expandable to 8MB)
- 1.44MB 3.5" Diskette Drive*
- Zero Wait-State Operation
- Slimline Compact Footprint
- 80287 Math Coprocessor Socket
- DOS 4.01 Included

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Tempo 286/12

- 80286 12MHz CPU
- Standard 1MB RAM (Expandable to 4MB)
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- Zero Wait-State Operation
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- DOS 4.01 Included

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Tempo 286/16

- 80286 16MHz CPU
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- 1.2MB 5.25" Diskette Drive
- Zero Wait-State Operation
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- 80287 Math Coprocessor Socket
- DOS 4.01 Included
- Novell® Certified

In a word, value.

Tempo™ is a new family of low cost IBM®-compatible PCs from one of the most respected companies in the computer industry. Everex.™

Don't let the low price fool you. For sheer computing performance, in an office or

on the road — Tempo never lets up. They're everything you or your company will need for optimum PC performance.

Additional Tempo features include an enhanced keyboard. One parallel and two serial ports.** Eight expansion slots for the large and small footprint models, four for the

slimline compact footprint, and one proprie-



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Tempo 386SX/16

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- Zero Wait-State Operation
- Small or Large Footprint
- 80387SX Math Coprocessor Socket
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- Microsoft® Windows™ Version 3.0

\$1999



Tempo 386/20

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- Standard 1MB RAM (Expandable to 16MB)
- 64KB Static RAM Cache
- 1.2MB 5.25" Diskette Drive
- Zero Wait-State Operation
- Socket for Intel 80387 or Weitek® 3867 Math Coprocessor
- DOS 4.01 Included
- Novell Certified
- Microsoft Windows™ Version 3.0

\$2199



Tempo 386/25

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- Standard 1MB RAM (Expandable to 16MB)
- 64KB Static RAM Cache
- 1.2MB 5.25" Diskette Drive
- Zero Wait-State Operation
- Socket for Intel 80387 or Weitek® 3867 Math Coprocessor
- DOS 4.01 Included
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- Microsoft Windows™ Version 3.0

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Tempo LX

- Intel 80386SX 16MHz CPU
- VGA Backlit Display
- 2-3 Hour Battery Life
- Power Conservation Mode
- 1-Hour Quick Charge
- Full Travel, 82° Key Keyboard
- 1MB RAM (Expandable to 5MB)
- 20MB Internal Hard Drive
- 1.44MB 3.5" Internal Diskette Drive
- 80387 Math Coprocessor Socket
- DOS 4.01 Included
- 6.9 lbs. (Including Battery)
- Padded Carrying Case
- Microsoft Windows™ Version 3.0

tary for the Tempo LX. 1:1 interleave hard disk controllers. And, they're supported by a full array of Everex peripherals.

What's more, every Tempo PC is compatible with the high-performance Everex STEP™ line of computers. In fact, the same high standards in quality engineering that go

into every STEP computer product, also go into every Tempo product.

Tempo computers are backed by a full one-year parts warranty and a three-month on-site service warranty.*

Catch the Tempo family at a reseller near you. To find out where, call 1-800-437-

EVER. Outside the U.S., call 415-498-1111 or FAX us at 415-651-0728.

But hurry. Because at these prices, the Tempo is going to move fast.



CIRCLE 113 ON READER SERVICE CARD

BS: (C9) (W13) 1886849
 1) PERSUN 2) PERSUN 3) QUICKING 4) QUICKING 5) QUICKING 6) C9-2-35

Access cell values in the browsed sheet

Southern Region Sales		
Product Line	Cash Sales	Installment Sales
Appliances	\$1,462,572	\$18,488,000
Automotive	\$2,446,557	\$947,324
Cooling and Heating	\$4,124,887	\$7,519,357
Hardware		
Lawn & Garden		
Lighting		
Office		
Outdoor Living		
Pet Care		
Sporting Goods		

Eastern Region Sales	
Product Line	Cash Sales
Appliances	\$1,286,014
Automotive	\$1,447,853
Cooling and Heating	\$5,557,333
Hardware	\$4,882,661
Lawn & Garden	\$814,675
Lighting	\$264,336
Office	\$1,445,242

16-Apr-91 03:28 PM

Look&Link lets you view, cut, copy, and link cells from another worksheet into your current 1-2-3 worksheet.

Linkfun loads worksheets or groups of worksheets and links cells and ranges. You can also use *Look&Link* menus to set up connections with Release 2.2's linking syntax, but if you work with password-protected files, it will not let you swap, consolidate, load them into memory for faster processing, or access them with *Link @functions*. *Look&Link* is an excellent value that makes 1-2-3 more flexible, more powerful, and easier to use.

Macro Editor/Debugger by Craig Stinson

No self-respecting C, Pascal, or assembler programmer would go to work without decent editing and debugging tools. Yet *Lotus 1-2-3* macro programmers, employing the world's most widely used application development language, have been doing just that for nearly a decade. Now, by adding in Personics Corp.'s \$199.95 *Macro Editor/Debugger (MED)*, hardy macro writers can discover what they've been missing all this time. *MED* brings modern amenities to the wilderness of 1-2-3.

As its name suggests, *MED* is both an editor and a debugger. You can use it to create new macros, modify existing ones, and, perhaps most importantly, track down errors when things go awry (as they all too often do).

You can invoke *MED* in the conventional add-in manner, by pressing an Alt-function key combination. Or you can simply attach it and press Shift-F2 to invoke 1-2-3's Step mode. Then, whenever you run a macro, *MED*'s debugging

window appears over the lower half of your screen. From the debugging window, you can press F2 to switch to the editing window. From either window, you can press the slash key to summon *MED*'s own menu system.

THE EDITING WINDOW

The editing window is divided, by default, into three panes: routine and variable labels, macro code, and comments. The labels and code must be in adjacent columns, but the comments can be offset from the code by whatever number of columns you specify. If you need to give more width to your code column, you can simply eliminate the comments pane or labels pane.

Unlike *Quattro Pro* and *Excel*, the *MED* editor stops short of letting you select macro commands from menus, but it offers conveniences not found in those

competing products. Enter text in the labels column, for example, and *MED* automatically turns it into a range name for the adjacent code cell. If you delete text from the labels column, a range name is removed. Press F3 while typing a macro command, and *MED* lets you incorporate a cell or range address by pointing to it. Press F3 twice and you can build a range name into a macro command by selecting the name from a list.

You can also insert a row within the editor window; *MED* will poke the new cells into the three working columns of the current macro. First it checks to ensure that you won't butt two macros together in the process. Delete a row, and *MED* takes cells only from the three working columns; the rest of the worksheet is not affected.

THREE MACRO MODES

The debugging window is split into two panes. On the left, you see the current code cell plus six lines of context. The right pane displays the current values of up to four watchpoint variables plus the name of the current routine, and the name of the current caller for subroutines. You'll find the caller information invaluable for sorting out macros that overflow the return stack.

You can begin macro execution at any cell. Just point to it and run in any of three modes: an instruction at a time, a cell's worth of instructions at a time, or full speed to the next breakpoint. At any point while execution is paused, you can easily switch to the editor, fix a statement, or change a variable's value, then return to the debugger to resume execution from where you left off.

FS7: (C2) (W12) *F45-F55

	A	B	C	D	E	F
11	INCOME STATEMENT 1990: Doonessee Editorial Services, Inc.					
12						
13		Q1	Q2	Q3	Q4	YTD
14						
15	Net Sales	\$21,000.00	\$25,600.00	\$22,400.00	\$23,600.00	\$72,600.00
16						
17	Operating Expenses:					
18	Payroll	4,200.00	5,320.00	4,400.00	7,140.00	21,140.00
19						
20	[successful the rest of this cell will be skipped Press ENTER or]					

31-Dec-90 09:36 PM

The debugging window in *Macro Editor/Debugger* displays informative messages while you single-step through your macros.

You Find The Best Values In The Most Unusual Places...

North Sioux City, South Dakota, for example. This little town probably doesn't come to mind when you think of shopping for a personal computer. And yet the best values in the PC industry come from North Sioux City, home of Gateway 2000.

Gateway 2000 has roots firmly planted in this part of the country. When buffalo still roamed the great plains, George Waitt founded the Waitt family cattle business in the frontier town of Sioux City, Iowa. Family legend says he started his herd by saving cattle that jumped off barges into the Missouri River.

Over a century later, George's great, great grandson, Ted Waitt, founded Gateway 2000 in the same tradition. Gateway was started by rescuing PC users who were stranded in a marketplace without a source of quality, affordable computers.

Today, Gateway 2000 continues the tradition of providing the best value in the industry, based on old-fashioned Midwestern values.



t Value In The Industry – And It All



We Value Quality

Being frugal doesn't mean skimping on quality. Only the highest quality components from the most quality-conscious suppliers go into a Gateway 2000 computer. Midwestern pride in workmanship and quality is demonstrated by every one of nearly 100 skilled assembly technicians. These technicians build your complete system one at a time.

"Total Quality Management" is Gateway's commitment to quality. TQM is a progressive quality philosophy developed by W. Edwards Demming, a native of Sioux City, Iowa. TQM is widely used to increase quality and productivity. Its use throughout Gateway 2000 has allowed the company to continually improve operations – even while the firm is growing at a phenomenal rate. To provide the best value in the industry, Gateway 2000 must value quality.

Product Testing: "I test the computer before it goes out. If anything looks questionable, we fix it immediately."

Assembly Technician: "Building a computer, I try to make sure my machine is built right from the start."



Jerry Mayer, Vice President, Operations: "TQM consists of continuous process improvement activities involving everyone in the company, managers and workers, to improve value and customer satisfaction at every level."

We Value Strength

A company's strength is measured by its balance sheet. As independent sources will confirm, Gateway 2000 has an enviable balance sheet coupled with strong growth. Inc. Magazine listed Gateway as the second fastest-growing private company in America during 1990. Financial strength is crucial to you. What good are warranties, guarantees or promises of lifetime technical support if the company that sold you the computer goes out of business? To provide the best value in the industry, Gateway 2000 must be strong.

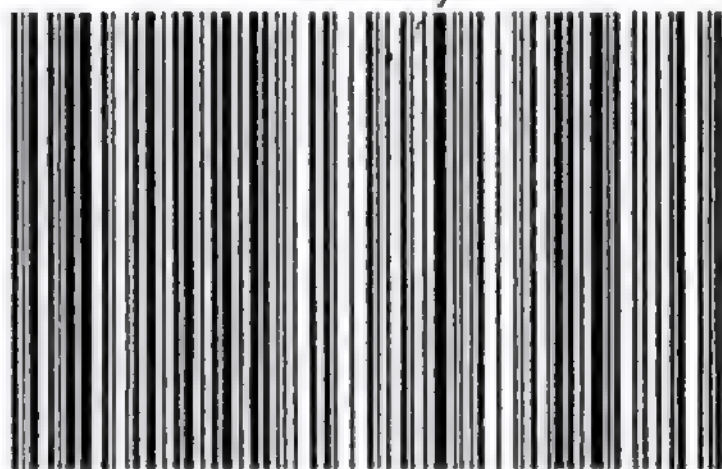


Although Otis, Rock, Luther and Chili Dog are evidence that Gateway has plenty of brute strength, the company's real strength is in a robust balance sheet and healthy growth. Otis is our nickname for John Staley; Rock is Mike Hingst; Luther is Brent Culbertson; and Chili Dog is Brent VanderWeil.

1. Follow instructions on the other side

Back

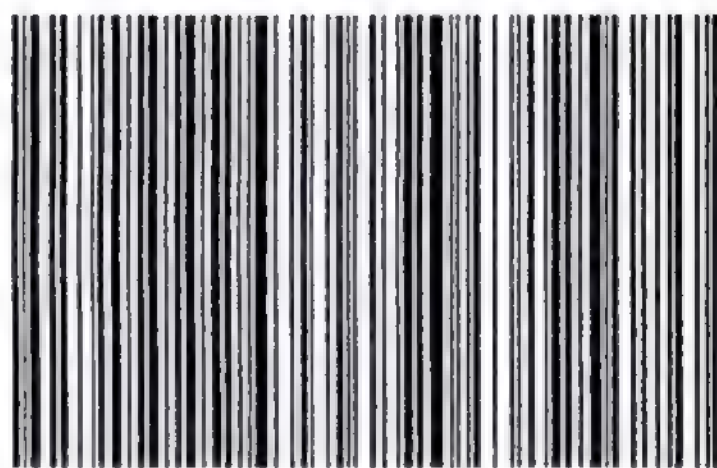
Gbs5lipback-001B



Inverted Back

1. Follow instructions on the other side

Folded edge of the page



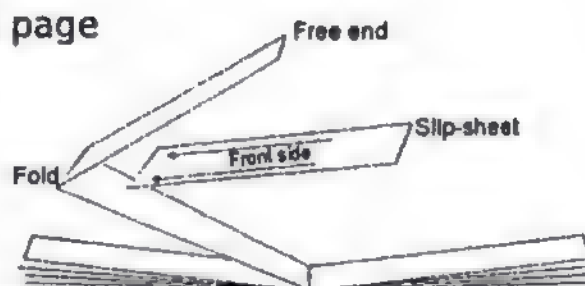
GbsSlipSheet-001

Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page
2. Arrow pointing to the fold

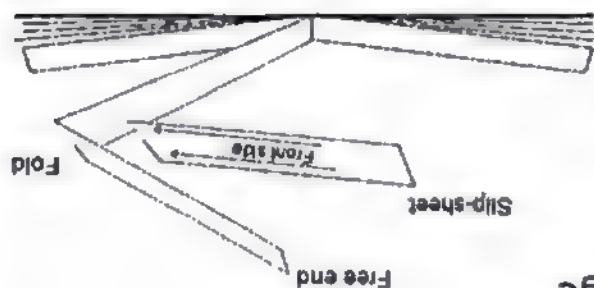
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page
2. Arrow pointing to the fold

3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

That's The Best

"Whenever I'm asked," continued Ted Wait, "why Gateway 2000 is so successful, my answer is: value. When you buy a Gateway 2000 computer, you're getting the best price, best quality and features, best service, all from a very strong, healthy company. That's value."

"Then I'm asked how we provide value," Ted remarked, "and the answer is almost the same. It's values. The values of the people at Gateway 2000 give our product its value," he said.

"People who grow up in the Midwest are inevitably shaped by the values of a culture that is one way or another dependent on the earth," he explained. "And when you depend on the earth for your living, you learn to value frugality, quality, resourcefulness, hard work, strength, and most of all, integrity and honesty in all of your dealings with other people. Providing value in our products starts with these values."



Earle Grueskin, Facilities Manager: "Our plant is a functional, no-frills, 70,000 square-foot metal building with a gravel parking lot. Someday we might pave the parking lot. Then again, we're getting along OK with the gravel."

We Value Frugality

Being frugal is the opposite of being wasteful. At Gateway 2000, the company doesn't waste time or money. For example, when a new plant was constructed in 1989, the company didn't waste money on showy, chrome-and-glass corporate offices. The new facility houses an efficient factory and functional offices. Although the company that sells more systems through the direct market channel than any other PC manufacturer in the nation can certainly afford luxurious offices, that wouldn't be frugal – and to provide the best value in the industry, Gateway 2000 must be frugal.



Barry Beldin, Production Manager: "We test each computer before it goes to shipping to make sure it's working properly."

Ken Gardner, Assistant Manager: "When I'm building a picture, I'm going to go to the source, who I know is the best."

...Like South Dakota, Who Saved \$10,747,

"We asked an independent research firm to do a study for us," said Ted Waitt, Gateway 2000 President. "I wanted to see an unbiased, direct comparison of features and prices from the manufacturers who advertise in the Computer Shopper. The results were astonishing," he exclaimed, "even to me. Ranked by best price, Gateway 2000 was the only major direct marketer at the top of the lists. The other 'big guys' in the direct market field were so far down in the rankings I couldn't even find some of them. Get a copy of the study and see for yourself."*



"This study proves what we've been saying all along. Gateway 2000 clearly offers the best value in the computer industry." Ted Waitt, Gateway 2000 President

Computer buyers who purchased Gateway 2000 systems in January saved an average of \$697 per system. This figure comes from a comparison of 132 computer manufacturers' advertised prices in the January 1991 issue of Computer Shopper – the nation's most comprehensive source of direct market computer products.

That means Gateway customers shared a total savings of \$10,747,179 on 15,427 systems in one month alone. Call for your free copy of the study, which includes details of how the information was prepared, and compare for yourself. This kind of value is worth investigating.

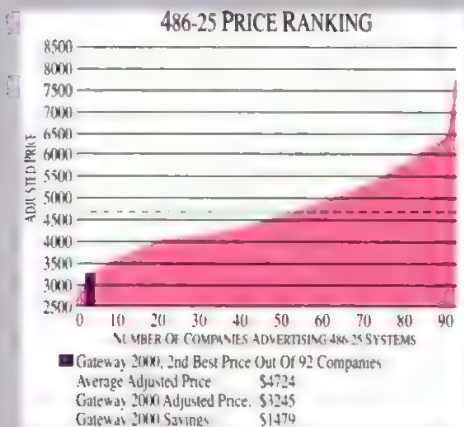


Gateway 2000 Customers 179 In One Month.



The Badlands of South Dakota are a moonscape on earth.

Prices in the 386SX-16 study were adjusted to reflect a system configuration including 4 MB RAM, 1.2 MB 5.25" Disk Drive, 1.44 MB 3.5" Disk Drive, 40 MB Hard Drive, 16 Bit VGA with 512K, Color SVGA Monitor, Keyboard, DOS, 1-year warranty and 30-day guarantee.



Prices in the 486-25 study were adjusted to reflect a system configuration including 64K Cache RAM, 8 MB RAM, 1.2 MB 5.25" Disk Drive, 1.44 MB 3.5" Disk Drive, 100 MB Hard Drive, 16 Bit VGA with 512K, Color SVGA Monitor, Keyboard, DOS, 1-year warranty and 30-day guarantee.

**Call 800-523-2000 and talk to a sales representative for further information about this study.*

Gateway 2000 Systems

12MHz 286VGA

- 80286-12 Processor
- 1 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 512K
- 14" Gateway Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01

\$1495.00



GATEWAY 386SX

- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 512K
- 14" Gateway Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$1895.00



25MHz 386 VGA

- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 1 MB
- 14" Gateway Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$2395.00

25MHz 386CACHE

- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16 Bit VGA with 1 MB
- 14" Gateway Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

\$2695.00



33MHz 386VGA

- 64K Cache RAM
- 4 MB RAM
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Starts With Values.



Kevin Costner photographed this same South Dakota buffalo herd for his movie, "Dances With Wolves."

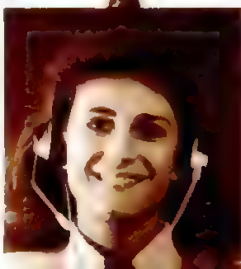
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Customer Service:
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customers informed. I
really push to make
sure we live up to our
commitments."



Wade Ridenour,
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listening. If you listen
to the customer, and
answer questions
honestly and
knowledgeably, the sale
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any high pressure
tactics or hype."



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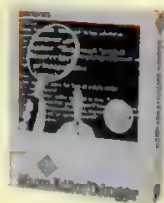
FACT FILE

Macro Editor/ Debugger, Version 1.0

Personics Corp., 63
Great Rd., Maynard,
MA 01754; 800-445-
3311, 508-897-1575.
List Price: \$199.95.
Requires: 62K RAM,
DOS 2.0 or later.

In Short: Macro

Editor/Debugger creates, modifies, and tracks down errors in macros. If you've ever spent an hour or two debugging 1-2-3 macros, this product is a must-own add-in that could make macro development fun.



CIRCLE 419 ON READER SERVICE CARD

MED can store up to nine breakpoints in three types. Execution breakpoints stop your macro when a specified code cell is reached. Update breakpoints stop when a specified cell gets a new value. And conditional breakpoints stop whenever a stated condition (a variable exceeding some value, for example) is met. You can attach a count value to any breakpoint, so that execution proceeds until the breakpoint has been reached a specified number of times.

MED is well tailored to the needs of 1-2-3 programmers. For example, it overlays its window on 1-2-3 rather than reducing the size of the 1-2-3 window. So if your macro depends on the window's having a standard number of rows, *MED* won't interfere. You can remove *MED*'s display at any time if you should want to take a peek at the underlying worksheet window.

You can leave {windowsoff} and {paneloff} instructions in the macro while you debug. *MED* will continue to update the screen and panel so you can see what's going on. Since it keeps a snapshot of the screen's status at the time the {paneloff} or {windowsoff} instruction appears, you can always take a look at the screen as the macro's user will see it. If your macro includes a {breakoff} instruction, *MED* will provide an on-screen indicator but still allow you to interrupt your macro, should you so desire.

On top of all these valuable services, *MED* offers a clearly written manual that includes a tutorial, a chapter on undocumented characteristics of the 1-2-3 macro language, and a full elaboration of each *MED* error message. If you're serious



P.D.Queue

by Craig Stinson

The ability to crunch numbers while a spreadsheet prints is one of numerous enticements for the *Lotus 1-2-3*, Release 2.x, user to make the move up to Release 3.1. With Funk Software's *P.D.Queue*, you can enjoy the convenience of background printing without doing the big upgrade.

BACKGROUND PRINTING

This \$89.95 add-in intercepts any jobs on their way to any printer and turns them into spool files on disk. The data is then unobtrusively fed to the appropriate printer while you continue to work. Additional jobs sent to the printer while the first job is printing are automatically stored in a queue and output in the order in which they were received.

The most obvious benefit of *P.D.Queue* is that it makes 1-2-3's WAIT light go off a lot sooner than it otherwise would, a convenience of particular interest to those with dot-matrix printers. But it can also make a big difference to anyone who prints lots of worksheets on any kind of printer. In our evaluation, a LaserJet II print job that held up the system for 52 seconds without *P.D.Queue*'s intervention took only 8 seconds with the add-in in place.

P.D.Queue can work with output from *Always* and *Impress*, as well as from 1-2-3. Without *P.D.Queue*, these publishing add-ins increase printing time dramatically; with *P.D.Queue*, the delays are



FACT FILE

P.D.Queue.

Version 1.0

Funk Software Inc.,
222 Third St.,
Cambridge, MA
02142; 617-497-
6339.

List Price: \$89.95.

Requires: 30K RAM,
DOS 2.0 or later.

In Short: P.D.Queue

brings background printing to 1-2-3, Release 2, allowing you to work while your printer churns. It stores up to 99 print jobs and reduces idle time without interfering noticeably with foreground work.

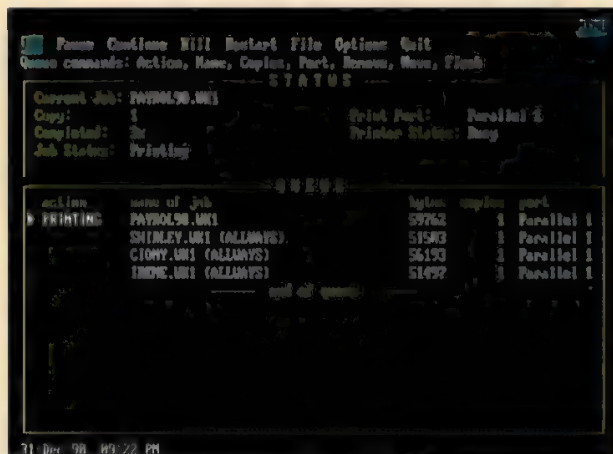


CIRCLE 418 ON READER SERVICE CARD

minimal. You can store up to 99 jobs in *P.D.Queue*'s print queue. While a job waits in line, you can pop up the add-in (by pressing an Alt-function key) to move the job to another position in the queue, remove it from the queue, or change its status to "hold" or "keep." A job in "hold" status stays in the queue but is not printed until you release it. The remaining jobs in the queue simply move around it as their turn comes. A job with "keep" status is printed but remains in the queue, allowing you to print it again whenever the need arises.

REDIRECTING OUTPUT

After a job has joined the queue, you can pop up *P.D.Queue* and change the number of copies to print or redirect output to a different printer, but not to a file. If you sometimes print locally and sometimes print to the network printer, you'll appreciate the freedom that *P.D.Queue* gives you to change your mind in mid-queue.



P.D.Queue reports the status of your printer and each job in the queue. The add-in intercepts print jobs and turns them into spool files on-disk so you can work in 1-2-3 while printing continues in the background.

SPREADSHEET FILE RECOVERY: Norton Utilities vs. Rescue Plus

by Ed Perratore

One of the most interesting new features of Symantec's *The Norton Utilities* 5.0 is its ability to repair damaged *Lotus* 1-2-3, *Symphony*, and *dBASE* files with its File Fix utility. Even if a damaged or erased file is severely fragmented across a floppy disk or hard disk, *Norton* makes a brave attempt to save it.

But does it do well enough? The truth is an ambiguous "maybe." Even the best file recovery algorithms offered today are most successful when the file is stored on one contiguous portion of the disk. Beyond that, it takes more technical savvy than you might expect to piece your lost data together.

All is not lost, however, especially if the erased or damaged file happens to be a *Lotus* 1-2-3 file. Intex Solutions' *Rescue Plus* does not pretend to be the last word on spreadsheet file recovery, but in our tests, it repeatedly bested *Norton*'s File Fix program.

FIVE UTILITIES

Rescue Plus, Version 1.3, is a \$129.95 collection of five utilities. *Rescue*, the flagship program, is the best route to restoring damaged 1-2-3 or *Symphony* files when your disk and its FAT (file allocation table) are intact. If you've lost a few bytes anywhere in the file, *Rescue* will make the file readable.

If the damage goes beyond the file itself, with bits and pieces scattered all over your disk, you'll need to do some file resurrection. That's where three other utilities—*ResQDisk*, *ResQView*, and *ResQFile*—come in. They aren't elegant or integrated, but collectively they offer a way to rebuild your lost file manually, using a technique that *Norton*'s Disk Editor utility has yet to match.

ResQDisk lets you search a disk for 1-2-3 data and generates crude but valuable reports on cluster ranges containing spreadsheet data, the size, and starting cluster of existing spreadsheet files on the disk. *ResQView* lets you view clusters to determine whether the lost data is present. *ResQFile* lets you build and edit a chain of clusters from a list

you compile, recreating the file as completely as any other software available.

If you've forgotten a password, *ResQ-Pass* will retrieve it for you, provided the file is not damaged in the particular part of the worksheet where the password information is stored.

TESTING THE PROGRAMS

To compare the performance of *Rescue Plus* and its chief competition, *Norton*'s File Fix, we attempted to recover small (6K–17K) and large (110K) files on several test disks. Throughout the testing, *Rescue Plus* did its job three to four times faster than *Norton*, often with better results.

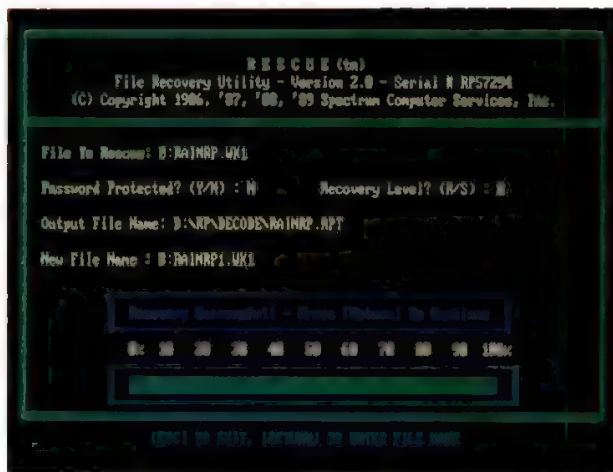
On the easiest test, we used *Norton*'s Disk Editor to scramble the first or last few bytes of a file. The two programs performed similarly—damaged files were restored intact—but with exceptions.

First, *Rescue Plus* blanked out cells containing any of three 1-2-3 @functions: @CTERM, @ISAAF, and @ISAAP, the last two of which are new to 1-2-3, Release 2.2. (Intex claims it will resolve these problems in the product's next release.) *Norton*'s problems were greater: it consistently blanked out a total of 18 @functions, including the popular @IF.

For the next test, we delved into the FAT of a test disk and jumbled several numbers to skew its record of where certain fragmented files were stored beyond their starting clusters. We used *Norton*'s Disk Doctor II to create .DD files from the lost clusters.

On this test, again *Rescue Plus* returned a file that was complete except for the three unsupported @functions. *Norton*'s Disk Editor/File Fix combination dropped about 13K of data.

On the last test, the most challenging, we looked at the packages' unerase functions. We filled a 360K floppy disk with



Rescue Plus's utility *ResQDisk* forms the first line of defense against permanent data loss. In this screen, the program is searching the entire disk for spreadsheet data; it will send its report to the printer.

2K and 4K text files, mapped their locations, then deleted them in selected groups to force fragmentation of six .WK1 files. Once all six files were copied—each fragmented much the way a typical hard disk stores data—we did a complete (*.*) deletion.

The results were not pleasant. From the 110K test file, *ResQDisk* unerased 90K; *Norton*, a mere 24K. Smaller files yielded poor results as well, with both programs restoring 12 to 40 percent of the original files without manual intervention. The lesson learned: back up often and defrag your hard disk.

While no one buys *Norton* solely for its File Fix program, the \$179 package offers a wealth of helpful utilities. If you work largely with 1-2-3 and you need the best insurance now available for spreadsheet file damage, *Rescue Plus* is the better choice. ■

The Norton Utilities, Version 5.0, Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 408-253-9600. **List Price:** \$179; upgrade from Version 4.5, \$49. **Requires:** 512K RAM, DOS 2.0 or later.

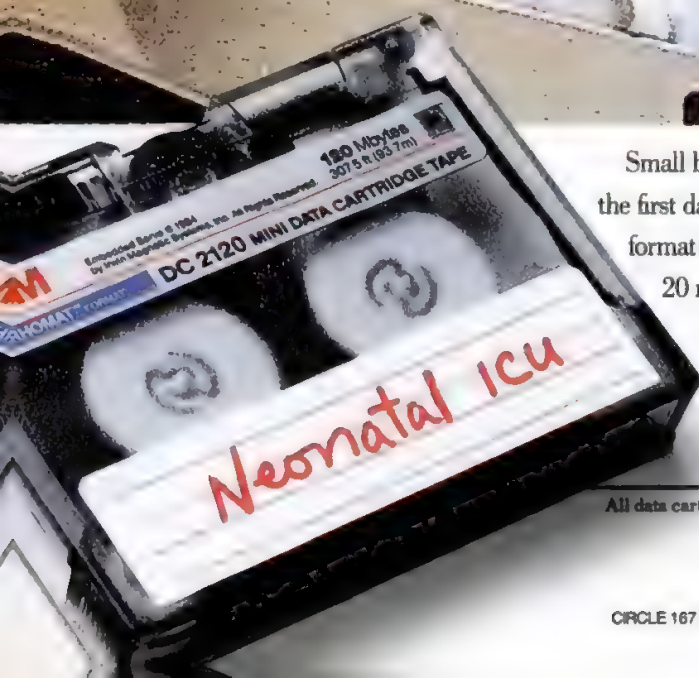
CIRCLE 397 ON READER SERVICE CARD

Rescue Plus, Version 1.3, Intex Solutions Inc., 161 Highland Ave., Needham, MA 02194; 617-449-6222. **List Price:** \$129.95 (\$149.95 for Release 3.0—compatible edition). **Requires:** 256K RAM, DOS 2.0 or later.

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Display	VGA Sidelit CCFT Paper White VGA LCD 256KB Video RAM 64 grey shades support	VGA Edgelit LCD 16 grey shades support
Keyboard	Standard AT-compatible 3mm key travel depth	Enhanced keyboard 2.5mm key travel depth
Memory	1MB expandable to 6MB	2MB expandable to 10MB
Software Incl.	Laplink III MS-DOS Windows 3.0	Not available
Support	Toll-free 800 number On-line modem support	Not available
Price	20MB - \$3999 40MB - \$4499	30MB - \$6499 60MB - \$6999



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CIRCLE 316 ON READER SERVICE CARD

The degree to which *P.D.Queue's* background activities interfere noticeably with your foreground work depends on your computer, your printer, and the size of your printer's buffer. (*P.D.Queue* sends data to the printer in bursts, filling the printer's buffer; when the buffer's contents have been printed, *P.D.Queue* sends another burst.) On a 16-MHz 386 system used for testing, a worksheet that otherwise took 24 seconds to recalculate took less than a second longer with *P.D.Queue* printing; without stopwatch timing the difference would have been undetectable.

Error handling in *P.D.Queue* is disappointing. If you run out of disk space while the add-in is writing a spool file, you'll hear a distinctive beep. But if your printer runs out of paper or someone kicks out the cable, you won't be notified unless you pop up the add-in to check the status of the queue. If your printer is down the hall, it might be a while before you know anything is wrong. This one complaint aside, *P.D.Queue* is a thoroughly satisfactory utility. It'll help you get more work done in 1-2-3.

3-2-1 Gosub

by Craig Stinson

With Frontline Systems' 3-2-1 *Gosub*, you can expand 1-2-3 Release 2.x's built-in function library much the way an *Excel* user can add to the *Excel* function library. With the \$99.95 Standard Edition, your custom functions are reinterpreted each

time they're called and must be stored on the worksheet where they're used. With the \$249.95 Developer Edition, you get a compiler that turns your custom functions into add-ins of their own. Consequently, your functions do their calculations more quickly and can be used in any one of your worksheets.

BUILDING CUSTOM FUNCTIONS

For creating custom functions (as opposed to custom applications), the Developer Edition of 3-2-1 *Gosub* is an alternative to Lotus's *Add-in Toolkit* for Release 2.x. You can use it for your own benefit or for creating commercial add-ins, by including acknowledgments and disclaimers prescribed in Frontline Systems' license agreement. Unlike the *Lotus Toolkit* for Release 2.x, it requires no knowledge of C or assembler.

Whether compiled or simply stored on the worksheet, a custom function offers the same benefits as a built-in function: It allows you to encapsulate a complex calculation in a simple statement. If you use lengthy formulas or sequences of formulas repeatedly on your worksheets, you can probably save time and improve readability by employing custom functions instead. If you sometimes have to modify complex routines that are used in many places, you'll be way ahead of the game by storing the changeable logic in a custom function definition.

EMULATING RELEASE 3

3-2-1 *Gosub* includes 11 "function-building" functions. You use these in combination with ordinary 1-2-3 formulas to define your own functions. Here's how you might write a 3-2-1 *Gosub* custom function to emulate Release 3's @D360:

```
@ArgCheck ("##")
360*@YEAR (@Arg (1))
30*@MONTH (@Arg (1))
@IF (@DAY (@Arg (1))=31#AND#DAY
(@Arg (2))>29,30,@DAY (@Arg (1)))
360*@YEAR (@Arg (2))
30*@MONTH (@Arg (2))
@IF (@DAY (@Arg (2))=31,30,@DAY
(@Arg (2)))
@SUM (A2..A4) @SUM (A5..A7)
+A8-A9
```

The first formula, @ArgCheck ("##"), ensures that two numeric arguments are passed to the custom function; if more,

fewer, or wrong arguments are given, @ArgCheck terminates the function and returns ERR. @Arg(1) returns the value of the first argument, and @Arg(2) returns the value of the second. The value returned by the custom function is the value of the last cell in the definition (A8-A9 in the example).

You would store these statements in a contiguous range and assign a name to the entire range such as DAY360 (not D360, since D360 is a worksheet cell address). Then you could call the function with a formula such as @(\$DAY360,END,START), where END and START are names of cells containing dates.

The processing of a custom function definition normally runs row-by-row through the definition range and stops at the lower-right corner cell. But you can use a @GotoIf function to build loops (recursive or otherwise) and other alternative execution paths. An @Return function allows you to terminate your function at points other than the lower-right corner cell.

Other function-building functions offered by 3-2-1 *Gosub* include @Assign, which lets you poke values into cells; @Subrow and @Subcol, which allow you to operate on selected row and column elements within range arguments; and a couple of simple but useful debugging functions.

With this modest toolkit, you can take 1-2-3 into some fairly sophisticated mathematical territory. The 3-2-1 *Gosub* distribution disk includes some sample custom functions for performing arithmetic on complex numbers, calculating the future value of a series of unequal payments, performing various kinds of bond calculations, finding prime numbers, converting polar coordinates, solving quadratic equations, and a good deal more. Just for grins, there's even a custom function that returns 1 if the moon is full on a specified date—a decision-support tool of inestimable value.

With the help of these examples and Frontline's terse but cleanly written manual, you should be able to tailor 1-2-3 to your specialized needs—provided you have a solid understanding of 1-2-3, some knowledge of programming concepts, and patience. Designing functions in 3-2-1 *Gosub* is not as straightforward as writing simple BASIC programs, but for the person versed in 1-2-3, it's an order of magnitude simpler than using the *Add-In Toolkit*.



3-2-1 Gosub,

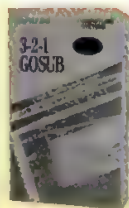
Version 1.0

Frontline Systems,
 124 University Ave.,
 #101, Palo Alto, CA
 94301; 415-329-
 6877.

List Price: Standard
 Edition, \$99.95;
 Developer Edition,
 \$249.95.

Requires: 3K RAM, DOS 2.0 or later.

In Short: 3-2-1 *Gosub* lets you write custom functions by encapsulating a complex calculation in a simple statement. Its eleven "function-building" functions take you into sophisticated mathematical territory. The Developer Edition includes a compiler so you can create function add-ins without programming in C or assembler.





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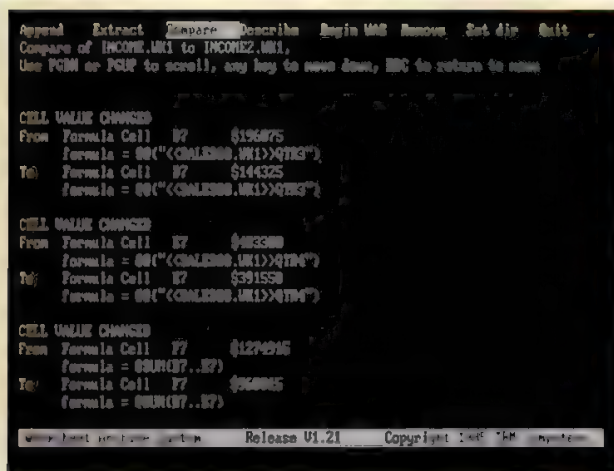
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CIRCLE 721 ON READER SERVICE CARD



The Worksheet Archive System can provide a detailed comparison of any two worksheet files.

Worksheet Archive System

by Craig Stinson

At \$79.95, TRM Computers' *Worksheet Archive System* (WAS) is almost as expensive as Funk Software's *The Worksheet Utilities*, even though the latter provides many services in addition to worksheet archiving. That's a serious strike against WAS. But the two programs take different approaches to archiving, and WAS has a few unique tricks up its disk sleeve.

A WORKSHEET HISTORY

In building its archive, WAS stores a history of the changes made to a worksheet, along with your comments and the dates on which changes were made. When you want to restore a particular version, WAS

uses its history transcript to recreate that version. *The Worksheet Utilities*, in contrast, preserves a compressed copy of each version. When you want to restore an earlier version of a worksheet, the program simply finds and unpacks it.

If you're archiving a large number of large worksheets, you're likely to save disk space with WAS. This may not be true, however, if you like to insert or delete rows or columns near the upper-left corner of your worksheets. In its history transcript, WAS records the contents and attributes of each changed cell, not the commands by which the changes are made. An insertion at row 2 of a 1,000-row worksheet, therefore, causes WAS to track at least 998 rows of modified cells.

VERIFY WORKSHEET CHANGES

As a by-product of its archiving method, WAS is able to offer a handy Compare command. This command presents—on-screen, in a disk file, or at your printer—a cell-by-cell listing of the differences between any two iterations of a worksheet. The list includes information about formatting and range name differences, as well as about changes in cell contents.

When it comes to giving a precise account of how you got from point A to point H, WAS's Compare command is beyond compare. This command also makes it possible to verify that a worksheet passed from user to user has not been modified in some subtle, unauthorized way.

Unlike *The Worksheet Utilities*, WAS is an add-on, not an add-in; that is, it's a standalone .EXE program that runs from

the DOS command line (TRM expects to release an add-in version also compatible with Release 3.1 this spring). If you have plenty of memory, you'll probably find the need to do your archiving from DOS, instead of from within 1-2-3, which can be an inconvenience. The opposite may be true if memory is limited; WAS, unlike *The Worksheet Utilities*, won't reduce the memory available for your spreadsheets. (If memory is quite limited, however, you won't even be able to run WAS by shelling out to DOS. You'll have to quit 1-2-3 altogether to run the archive program. That's a big nuisance.)

In short, WAS may be the right choice for users with limited memory or disk space, or for users with a particular need for detailed comparisons of worksheet iterations. Otherwise, this product looks pale next to its principal competitor.

The Worksheet Utilities

by Craig Stinson

Funk Software introduced *The Worksheet Utilities* in January, 1988, the era of Lotus 1-2-3, Release 2.01. While it has never been upgraded and some of its functionality has since been rendered superfluous by Release 2.2, this \$99.95 general-purpose utility set adds considerable value to 1-2-3.

TWO ADD-INS IN ONE

The Worksheet Utilities consists of two add-ins, CellWorks and FileWorks, which you can attach and detach separately to conserve resources. CellWorks includes five components: PrintSet, Formula Editor, Search and Replace, AutoSave, and Range Column Width. FileWorks is a DOS shell, a file compressor, and a worksheet archival system.

Search and Replace and Range Column Width are essentially equivalent to Release 2.2's /Range Search and /Worksheet Column Column-Range commands. They allow you to perform automatic global replacements and apply width changes to two or more adjacent columns. Release 2.2 users won't need these components.

AutoSave provides insurance against power outages and pilot errors by copying the current worksheet at user-configurable time intervals to a file that is named AUTOSAVE.WK1. A Restore command replaces the current worksheet with AUTOSAVE.



Worksheet Archive System, Version 1.12

TRM Computers,
2106 Arborview, Ann Arbor, MI 48103;
313-994-6289.
List Price: \$79.95.
Requires: 256K RAM, DOS 2.0 or later.

In Short: An add-on that must be run from the DOS command line, *Worksheet Archive System* is valuable chiefly for its detailed file-comparison capability.



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PC Magazine's Editor's Choice

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PrintSet looks like an implementation of the *Symphony* (and Release 2.2) print settings—sheet feature, but provides two important services omitted by Lotus: It lets you create a library of setup strings for each printer on your system, and it allows you to save named combinations of print settings—print range, margins, headers, footers. *Allways* and *Impress* eliminate the need to find setup strings in printer manuals, but the ability to invoke reports by name (instead of by chasing around the worksheet or writing custom-menu macros) remains invaluable. Unfortunately, PrintSet stops short of offering print preview or spooling, which is provided by Funk's spooler, *P.D.Queue*.

FORMULA EDITING

Formula Editor, the jewel of CellWorks, provides the best formula entry/editing services found in any spreadsheet package. You can enter the editor in Ready or Edit mode to get a multiline control panel plus a full screen of information and options. Here you select functions and operators from lists, read complete help information on any function (the help messages actually reproduce—with per-



The Worksheet Utilities' Formula Editor lets you debug complex formulas by calculating one term at a time.

mission—Lotus's printed documentation), and assign range names without leaving a formula.

As you build a formula, the editor shows you the exact placement of parentheses. And when you've stuffed so much logic into a formula that you can't read it, you can use the Calculate command (F9)

to sort it all out. Each time you press F9, the editor displays the current value of one term of the formula, beginning at the innermost and working its way out.

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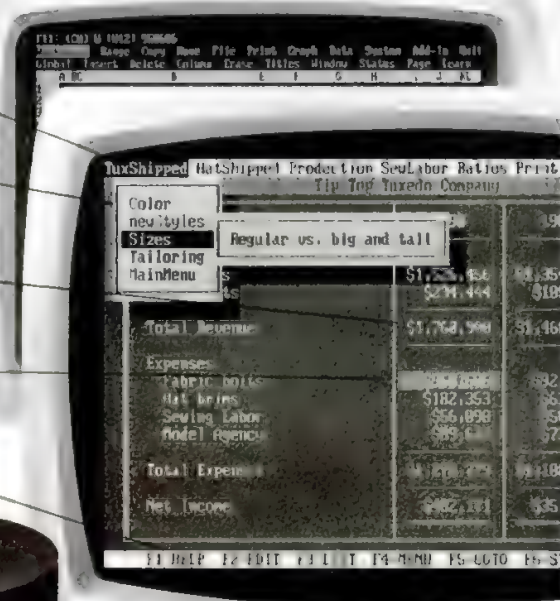
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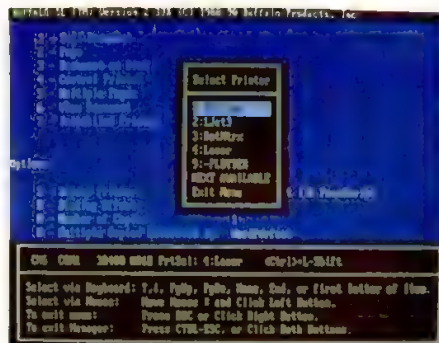
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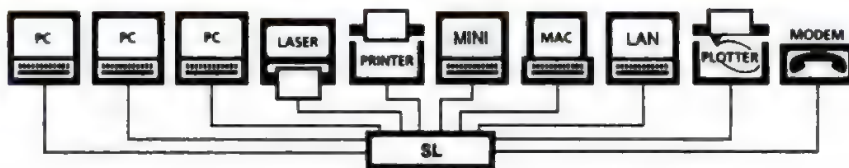
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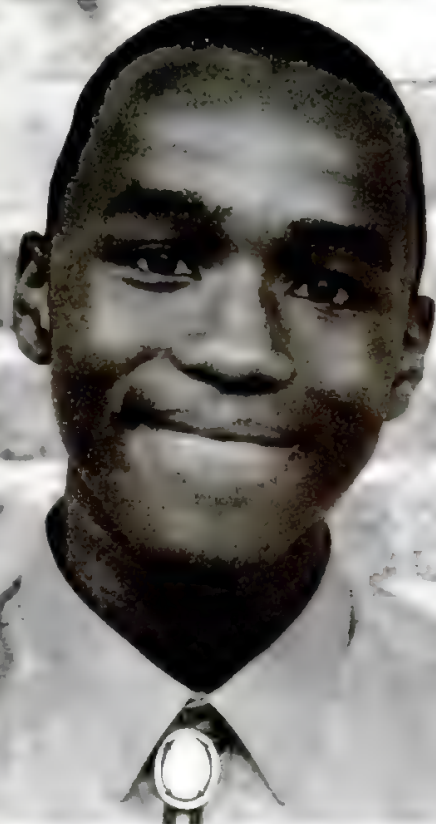
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DATA ENTRY
LOTUS 1-2-3 ADD-INS

shell: copy, move, rename, delete, change file attributes; create, remove, and change directories; and sort and print directory listings. Its windows show only .WK1 files, but you can alter or remove the filter to apply commands to other file types.

You can annotate files with comments, keywords, and "owner" names. These can then form the basis for filtered listings, helping you zero in on files containing particular kinds of information. A "peek" command gives you a look inside a selected file. Compared with the file-viewing capability of newer shell pro-



FACT FILE

**The Worksheet
Utilities,
Version 1.01**

Funk Software Inc.,
222 Third St.,
Cambridge, MA
02142; 617-497-
6339.

List Price: \$99.95.
Requires: 70K RAM
for Cell Works utility,
110K RAM for File Works utility.

In Short: Although some of its functionality has been duplicated by Release 2.2, *The Worksheet Utilities* is still a bargain for its formula editor, print-settings libraries, and worksheet archival services.



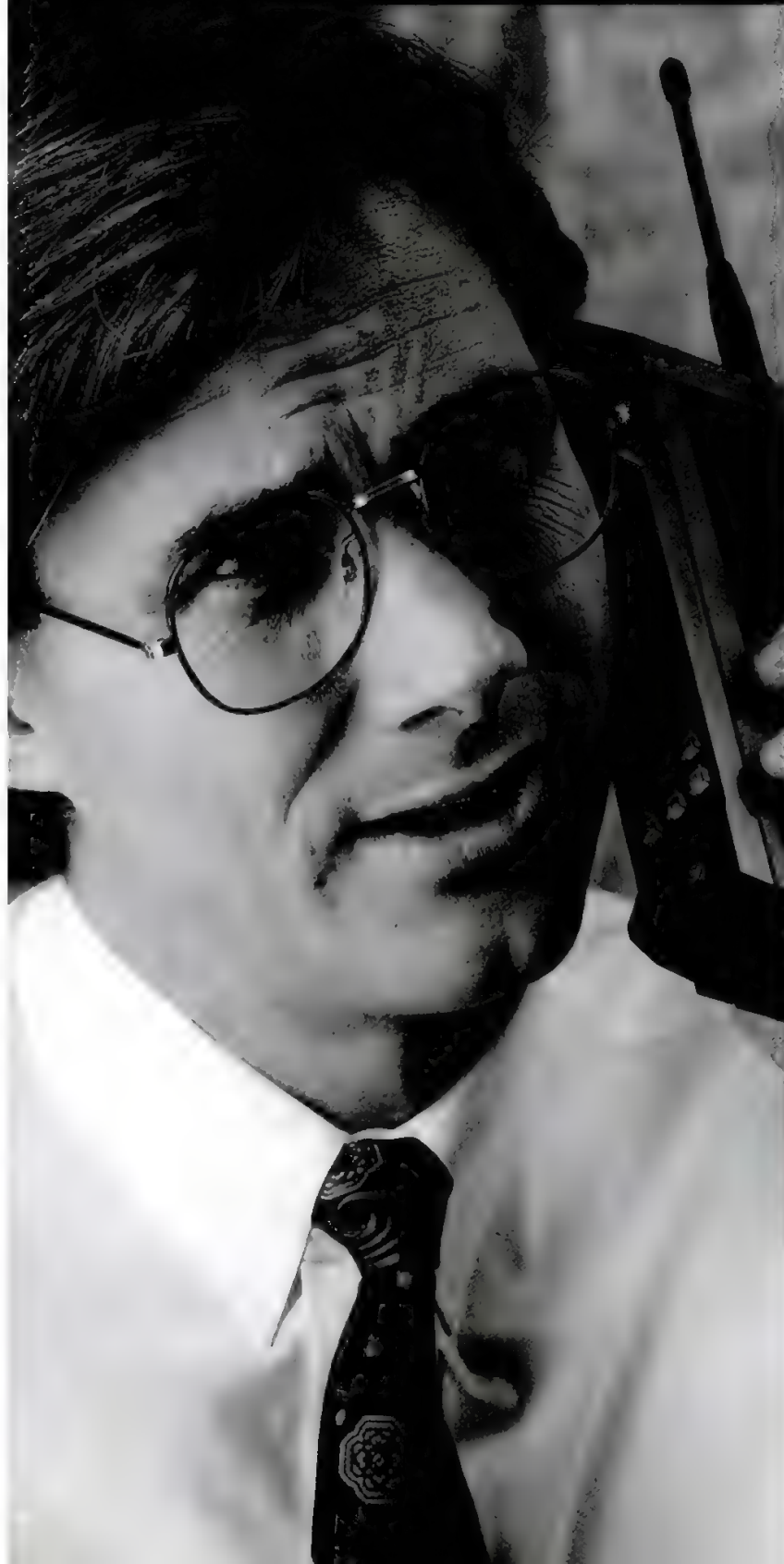
CIRCLE 420 ON READER SERVICE CARD

grams (such as *The Norton Commander* and *Lotus Magellan*), this aspect of *The Worksheet Utilities* is primitive: worksheets are listed rather than displayed as grids, and you can scroll only in the forward direction. But FileWorks redeems itself with an excellent search capability. You can find files containing particular words, formulas, or even range names.

FileWorks also performs compression and decompression, and most importantly, provides a system for archiving worksheets. FileWorks creates a separate subdirectory for each worksheet you archive, then stores each iteration of each worksheet, compressed along with dates and your comments. It's a more disk-intensive archival approach than that used by *Worksheet Archive System*, but you may appreciate knowing that your entire file is preserved, not just a history of changes.

The Worksheet Utilities is a great bargain for a wide spectrum of 1-2-3 users. After using it for a day or two, you may wonder why Lotus didn't incorporate all of its ideas into Release 2.2. ■

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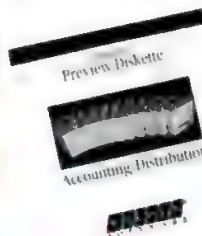
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All things being equal, they're not.

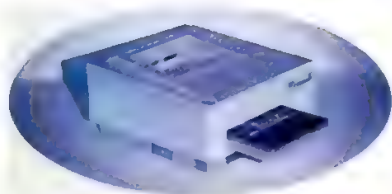
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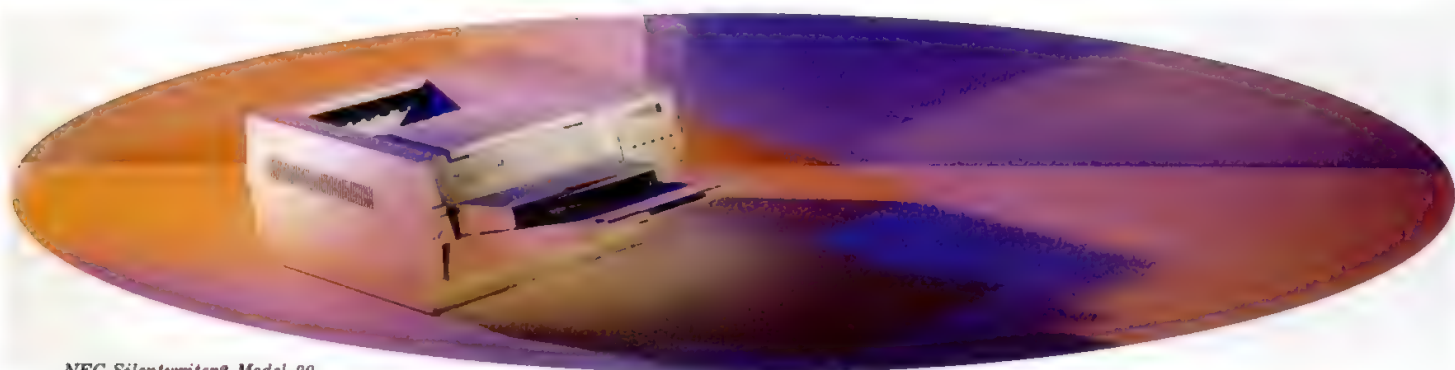
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November 13, 1990
SilentWriter2 Model 90

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Typefaces unlimited:



Handling fonts in *Windows 3.0* can be complicated, but a font manager makes it almost effortless. Here we take a comparative look at five programs in this hot category of products: *Adobe Type Manager*, *FaceLift*, *MoreFonts*, *Publisher's Powerpak*, and *SuperPrint*.



By Edward Mendelson

Freedom of the press has always meant that you can print whatever you want—short of libel or a headline that encourages looting and mayhem. With the arrival of font managers for *Microsoft Windows 3.0*, freedom of the press also means that you can print whatever you want in whatever typeface and size you want—and see it on-screen in precisely that typeface and size before committing it to paper. Today, anyone with a *Windows*-based PC and a dot matrix or laser printer can use more type designs in one day than most traditional print shops would call upon in a century. Using a font manager, you can choose among thousands scalable typeface designs in virtually any size.

Windows is capable of displaying fonts on-screen, but without help from a font manager, it does so in limited and inflexible ways. *Windows* automatically installs a small set of generic bitmapped fonts, which it uses as a rough substitute for any font that you intend to print, even when the printed font is very different in style and proportion. If you choose a point size that doesn't match one of *Windows*' pre-built bitmapped fonts, it simply stretches or distorts one of those fonts in an attempt to make a match. The results usually look more like an unstable pile of building blocks than a typeface. If you insist on a more exact match for your printer fonts, *Windows* normally makes you install a disk-hogging set of bitmapped screen fonts to match every typeface, point size, and style you intend to use at the printer. This is true even if you use a PostScript printer, which has scalable fonts built in.

The first hint that *Windows* could dispense with all these limitations came when Adobe Systems introduced *Adobe Type Manager* for the Macintosh early in 1990. *ATM* uses scalable typeface outlines to generate fonts for the screen "on the fly"—that is, at the moment you ask to use a particular font in your document. You no longer need to install bitmapped fonts in advance for your printer or screen or both, and you can experiment with any size or style of type you prefer, certain all along that what you see on-screen will match what you'll find on the printed page.

A NEW ERA DAWNS

Adobe released a *Windows* 3.0 version of *Adobe Type Manager* in October of last year. By that time, however, a whole market of competitors had sprung up in the *Windows* arena. Bitstream's *FaceLift* performs the same tricks with Bitstream's Speedo typefaces that *ATM* performs with PostScript Type 1 outlines. And Micro-Logic's *MoreFonts* and Atech's *Publisher's Powerpak* achieve on-the-fly font scaling using low-cost proprietary font outlines. Not long after these, Zenographics got into the act by adding on-the-fly scaling capabilities to its *SuperPrint* printer utility.

All of these font managers offer the basic capability of creating *Windows* 3.0 screen and printer fonts on the fly from scalable outlines, but they differ enormously in their range of supported typefaces, the quality of their screen and printer fonts, and their ease of use. All

support type formats that include "hints" to help improve output at small sizes and low resolution—the kind you get from laser printers. Yet, as the sidebar "Fonts on the Fly: How Font Managers Do It" shows, print quality on 300-dot-per-inch laser printers can range from excellent to

When you choose a font manager, you should first consider the range of typefaces you'll be able to use with it.

dreadful, and screen fonts show similar variations. Likewise, all the reviewed packages install easily, but some of them force you to go to needless trouble to install additional typefaces or to change options that exist more to smooth over complications in the program than to serve the convenience of the user.

Another competitor, *Intellifont for Windows*, was not available at review time but should be shipping by the time you read this. A free utility from AGFA and Hewlett-Packard, this program lets you scale typefaces in AGFA's Intellifont format (the native format of the HP LaserJet III and IIID) in the same way that *ATM* scales Type 1 fonts.

WHICH FACE?

When you choose a font manager you should first consider the range of typefaces you'll be able to use with it. Font managers like *ATM* that support PostScript Type 1 outlines give you access to by far the widest range of typefaces, even offering the same typefaces that are standard on the Macintosh and are used by service bureaus for high-resolution output. About a thousand hinted Type 1 typefaces are available now for the PC. Most come from Adobe and its licensees Linotype, Monotype, and AGFA Compugraphic, but you can also find a few hinted public-domain typefaces on CompuServe's DTPFORUM. If you print on

high-resolution output devices that don't need hints, Image Club Graphics can sell you a further 600 unhinted Type 1 faces. Thousands of hinted Type 1 faces now available for the Macintosh are waiting in the wings to be ported to the PC, including over a thousand from Bitstream, 1,600 from The Font Company, and 200 from Digital Typeface Corp.

On the PC, the main rival to Type 1 is Bitstream's proprietary Speedo format, which is used by *FaceLift*. Though Speedo isn't as widely supported as Type 1 and is incompatible with Bitstream's older *FontWare* format, 207 Bitstream typefaces are now available in Speedo form. Speedo's main advantage lies in its suitability for use with non-*Windows* applications printing to non-PostScript printers. Speedo is already usable with the current version of *WordPerfect* and will be used by a number of other major DOS applications due to appear in 1991.

Other scalable font formats exist for the PC but suffer from limited support and often limited quality. The Nimbus Q format, supplied by the Digital Typeface Corp., is supported by *SuperPrint*, which also supports Type 1, *FontWare*, Speedo, and AGFA's Intellifont. *MoreFonts* and *Publisher's Powerpak* use proprietary formats, which limit you to the fonts these manufacturers choose to supply. Fortunately, free conversion programs are available to turn PostScript Type 1 and Type 3 outlines into the *Powerpak* format and any Type 1 font into the *MoreFonts* format, though you pay a price in the quality of the result. For LaserJet III users, a free Hewlett-Packard conversion utility lets you convert Bitstream's *FontWare* typefaces into an unhinted version of Intellifont.

Waiting in the wings, meanwhile, is TrueType, the advanced scalable typeface format developed by Apple and Microsoft for the next generation of Macintosh and *Windows* software. TrueType won't supplant existing formats, but it may well become a standard to rival PostScript's Type 1. When TrueType arrives in *Windows* 3.1 later this year, it will work essentially the way *ATM* and *FaceLift* work now, using the TrueType outlines for both screen and printer. Printers that support TrueType will be able to use Type 1 fonts transparently, but you'll still need a font manager to scale Type 1 fonts accurately on-screen. Many current *Windows* font managers will work in concert with TrueType without change;

the rest will work after a minor upgrade. But until *Windows 3.1* arrives, it's impossible to say for certain which font managers will need to be upgraded.

TAKING THE BAD WITH THE GOOD

Unfortunately, the flexibility of font managers come with some pitfalls. It takes a font manager more time to generate a screen font than it takes *Windows* to use a

screen font that has been preinstalled. So when you use a font manager, you'll notice an annoying delay the first time in any *Windows* session that you use a particular font, even if you've used a different size or style of the same typeface earlier in the session. All font managers store the fonts generated during the current session in a

cache in RAM so that they can be reused during that session without delay. *FaceLift* and *SuperPrint* even let you store the font cache on-disk so that you can reuse screen fonts from an earlier session without waiting to regenerate them.

Font managers also slow down most printing jobs. True, when you use *ATM* with a PostScript printer, the printer generates fonts at the same speed as it does without *ATM*. And some font managers let you generate PCL4 bitmapped fonts in advance for faster printing with Laser-Jets. But in most cases, the characters are sent down to the printer as graphic images rather than downloaded as fonts in the format native to your printer. Since graphic images are notorious for printing much more slowly than fonts, if you plan to use a font manager for all your *Windows* printing, you should prepare to generate some patience while the font manager generates characters.

Font managers also do little to improve *Windows*' notoriously weak support of foreign and technical characters. Adobe Type 1 outlines contain around 230 characters—and Speedo outlines around 560—but you can't access all of them in *Windows* because *Windows* directly supports only 190 characters (plus the 188 characters in the built-in Symbol font). Special Type 1 "expert set" outlines with alternate character sets let you work your way around *Windows*' narrow-mindedness. You use these expert sets as you would use the *Windows* symbol font: You type in the keys for a standard character like a dollar sign and get the special character you really want. You'll need the keyboard chart supplied with the expert-set typeface, though, because *Windows* doesn't support simple mnemonics for special characters as *WordPerfect* does. Nor can it automatically replace strings like "ff" and "ffi" with their corresponding ligatures.

Finally, in the near term at least, the sophistication of your font manager may not be mirrored by your *Windows* applications. When you use any on-the-fly font manager (except *SuperPrint*) with *Word for Windows* and *Ventura*, for instance, the screen rewrites the current line after almost any letter you type, and the rapid flicker can be intolerable. *Ami Pro* rewrites the screen less frequently but still often enough to be bothersome. On the other hand, *PageMaker* and *Legacy* are usually smart enough to spare you the flicker effect. Try any font manager with

FONTS ON THE FLY: How Font Managers Do It

by Edward Mendelson

What happens between the moment you select a font (say, a 40-point Garamond Italic) from a *Windows* application's font menu and the moment when it appears on your screen?

Normally, when you make a font choice in a *Windows* application, the application program sends a call to *Windows*' GDI (Graphics Device Interface), asking for a matching screen font. The GDI, in turn, asks the video device driver which screen fonts it has available.

If you don't have a *Windows* font manager or third-party screen fonts installed, the device driver reports back that it has available the Times Roman, Helvetica, and Courier raster (bitmapped) fonts that are automatically installed in *Windows*, and that it has them in six sizes: 8, 10, 12, 14, 18, and 24 points. The GDI then uses a font-mapping algorithm that attempts to make the best possible match between 40-point Garamond Italic and this limited range of bitmapped fonts.

The GDI has already learned from the application (which itself received this information from the current printer driver) that Garamond is part of what *Windows* calls the Roman family, one of the five generic typeface families that *Windows* recognizes. Because the screen driver doesn't have a 40-point Times Roman bitmap, the GDI doubles the size of the 18-point bitmap to create a 36-point bitmapped font as the closest approximation. The resulting bitmap is not only the wrong size and wrong shape, but it has an inevitable "stair-step" effect on the diagonal strokes as a result of being doubled from its original size. If the application requests an italic font, the screen driver

simply slants the bitmap to the right and displays the results.

BIT BY BITMAP

If you have a font manager installed, the course of events is very different. Typically, the font manager intercepts GDI's request to the video driver for a list of available fonts and appends its own list of fonts—fonts that don't yet exist as bitmaps, but for which bitmaps can be created on demand.

If the GDI finds a Garamond Italic in this list, it tells the screen driver to produce the bitmap. Here, the font manager again intervenes. It reads the scalable outline's mathematical representation of the typeface, then scales that representation to the size requested. (A Type 1 outline stores the dimensions of a font as it would appear if printed at 1,000 points.) Then it rasterizes the rescaled outline—that is, it translates it into a bitmap that corresponds to the outline at the specified size.

At 40 points, some details of the typeface are going to be too small to display at the relatively coarse resolution of a computer screen. So the font manager's rasterizer applies a set of "hints" that force it to use enough bits to display all serifs and lines; it also makes other adjustments to guarantee that strokes that should have equal widths really do have them. This is essentially the same procedure the font manager uses when rasterizing fonts for 300-dot-per-inch laser printers.

When the font manager is finished creating the font, the font manager returns the bitmap to the video driver and issues a display request. The result is the accurate rendering of the text that you see on-screen. ■

your applications before buying.

Despite these minor limitations, *Windows* font managers transform the experience of working with a computer, giving you access to a cornucopia of typefaces at low cost and with little or no effort. If you care about your document's appearance or if you just want to see what it will look like before you print it, you'll find these five programs both delightful and indispensable.

Adobe Type Manager

All reviews by Edward Mendelson

You need to know only two things about *Adobe Type Manager*: It's easy to use, and it works impressively well. Once you've tried it, you'll wonder how you ever got along without it. Adobe's \$99 utility, which comes with 13 fonts, creates superb screen and printer fonts on the fly with exceptional fidelity and consistency in all point sizes. No other *Windows* font

manager is as transparent to use or as compatible across so wide a range of hardware and software.

Because *ATM* uses Type 1 PostScript outlines, all *Windows* printers, including LaserJets, dot matrix printers, and high-resolution plain-paper typesetters, now have access to a staggering number of type designs, most of them available at reasonable prices. Adobe charges \$49 to \$370 for individual font packages that include many subtle and brilliant designs developed by Adobe or licensed from other type designers (primarily Linotype).

Besides these packages, an *ATM* Plus Pack at \$198 lets you complete the standard 35-typeface PostScript font set by adding 22 typefaces to the 13 included with *ATM* itself. These 35 typefaces represent Adobe's earliest efforts; although now much improved over their mid-1980s versions, they still fall slightly below the ideal, and Helvetica Narrow (a mathematical reduction of Helvetica) is proba-

bly unsalvageable. Two Adobe Type Sets, each with seven superior typefaces, sell for \$99 per set; a third Type Set with 11 typefaces costs \$198.

ATM is also one of the most flexible of these font managers. It's one of only two *Windows* font managers that works with high-resolution non-PostScript devices like the LaserMaster (the other is *MoreFonts*). You can even use it simultaneously with any other *Windows* font manager to print *ATM* fonts and the other program's fonts on the same page. It keeps working without a hiccup when you switch *Windows* display drivers.

INSTALLS WITH EASE

Installing *ATM* is so simple that you can do it with your eyes closed: All you do is press Enter a few times to confirm the suggested directory names. If you have a PostScript printer, *ATM* automatically installs for its own use any PostScript fonts you've already installed for the printer. And when you later install new typefaces in *ATM*, it helpfully installs them for the PostScript printer also.

Installing most typefaces is effortless, although with early releases of Monotype fonts you need to change the names of the .PFM font metric files to match the names of the .PFB typeface outline files, or else install the fonts by hand-editing the *ATM.INI* file. *ATM* accepts up to 460 fonts, a limit due to be increased in a new version expected by midyear. This new version will also provide font management functions similar to those available in *Windows*' LaserJet driver.

ATM's Control Panel has only three options beyond font installation. One lets you change the size of the RAM-based font cache from the default 96K down to 64K or up to 8MB. Another tells *ATM* to defer to the bitmapped soft fonts or the built-in fonts installed in your printer drivers instead of creating its own matching fonts. This option increases speed but reduces the consistency of output; you'll find it useful only if you do a lot of draft printing in Courier.

A third option lets you turn *ATM* off, which you'll probably never need to do. When you start *Windows*, an italic *a* appears briefly in the lower-left corner of the screen to remind you that *ATM* is loaded; when *ATM* is switched off, the *a* is crossed out. You have to exit and restart *Windows* to turn *ATM* on or off. If you want to remove it from your system, the manual lists the simple steps involved.



EDITORS' CHOICE

• Adobe Type Manager

All on-the-fly font managers for *Windows* have their unique features, but none of the products reviewed here is as transparent and universally compatible as *Adobe Type Manager*, our Editors' Choice.

ATM installs so smoothly into *Windows* that you'll hardly notice it's there—until you use one of the thousands of Type 1 fonts that work with it. *ATM* gives PostScript printer owners screen fonts to match their printer fonts and effectively transforms a LaserJet or dot matrix printer into a fast PostScript text printer. And *ATM*'s line breaks are completely reliable: The line breaks you see on-screen will be the same as those you get on paper, even when using a dot matrix printer. *ATM* works together with all other *Windows* font managers, so you can combine *Adobe Type Manager*'s type-handling abilities with another font manager's special features.

Bitstream's *FaceLift* earns an honorable mention for producing excellent output with Speedo typeface

outlines; the outlines will also work with DOS applications like *WordPerfect*. Although the 207 available Speedo faces are no match for the multitude of Type 1 faces, they are more than enough for almost any print job. In addition, *FaceLift*'s many options help you fine-tune it for more-legible screen display and better dot-matrix output.

The other font managers, despite their unique capabilities, suffer from handicaps that make them less useful than either *ATM* or *FaceLift*. *SuperPrint*, for instance, supports all major scalable font formats and is the only package that spares you a flickering screen in applications like *Word for Windows* and *Ventura Publisher*, but it is complex and troublesome to use. And though *MoreFonts* is capable of some neat special effects, its output quality is unimpressive. *Publisher's Powerpak* is currently the only program that supports non-Latin alphabets, but its font quality is the weakest of all, and it doesn't support true italic and bold fonts.

HIGHLY RECOMMENDED

When *Accounting Today* (May 1990) asked accountants which accounting software package they recommended to their small business clients, an overwhelming 29% said they recommend Peachtree Accounting— that's almost double the next largest competitor.

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"If you could find a definition for Peachtree in the dictionary, it might be 'value for your money.'"-PC Magazine 4/10/90

***"It is, I believe, the best accounting package available for the price."*—E.J. Bosmeny, CPA, Naperville, IL**

"Complete III rivals packages costing 10 times as much."—PC Resource, July 1990

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C. McQuaid, McQuaid & Holland, Inc., Accountants,
Geneva, AL

"Installation is easy, data entry is fast...a joy to use."—PC Resource, July 1990

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CIRCLE 358 ON READER SERVICE CARD

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FACT FILE

EDITORS' CHOICE

Adobe Type Manager, Version 1.01

Adobe Systems Inc.,
1585 Charleston Rd.,
Mountain View, CA
94039; 800-344-
8335, 415-962-4809.

List Price: With 13 fonts, \$99; Plus Pack (22 additional fonts), \$198; additional font sets, \$49 to \$370 each.

Requires: 286-based PC or better, 1MB RAM (2MB recommended), graphics adapter (EGA or VGA recommended), DOS 3.1 or later, Microsoft Windows 3.0. Mouse recommended.

In Short: The most compatible and easy-to-use type manager for Windows, with excellent output from an enormous range of PostScript Type 1 typeface outlines.

CIRCLE 421 ON READER SERVICE CARD



The manual doesn't shout about it, but if you choose Windows' "Hlv" and "Tms Rmn" fonts at small sizes, *ATM* uses the faster built-in Windows screen fonts rather than its own fonts, although it substitutes its own Helvetica and Times Roman when printing. You can change the threshold at which *ATM* switches from Windows screen fonts to its own, but this is a task for experts; to do it you must adjust the settings in the *ATM.INI* file. And this thresholding doesn't work with any other fonts.

OPTING FOR SPEED

ATM performs at impressive speed on-screen (though its printing is sluggish), but because it has no provision for storing screen fonts on-disk, there's no way to avoid a slight delay every time you select a new font or size. And like most font managers, it makes you endure distract-

ing screen flicker in many applications. One of its notable strengths, though, is that line breaks on-screen seem absolutely reliable; with other font managers, especially when used with dot matrix printers, mismatches can occur between line breaks on-screen and on paper. And if your Type 1 typeface doesn't have a matching italic or bold font, *ATM* lets Windows create an oblique or pseudo-bold version on the fly.

Though no current application makes use of it, *ATM* offers a "back door" that allows applications to use the program for elaborate font manipulation such as rotation, skewing, or stretching. Applications can even get a character's Bezier curves through *ATM*, which will make it possible for users to alter the curves that make up characters, returning them to *ATM* for use on the screen.

If you want higher speed and reduced flicker with the fonts and sizes you use most often, the Font Foundry utility shipped with Adobe and Monotype Type 1 typefaces (but not with *ATM* itself) lets you generate bitmapped Windows screen fonts (as well as bitmapped LaserJet printer fonts or *Ventura Publisher* screen fonts). *ATM* will defer to these screen fonts, and you can save disk space by letting *ATM* generate fonts on the fly only for the larger sizes.

ATM is built into OS/2, Version 1.3, and Adobe says it's evaluating the possibility of creating a version for DOS applications like *WordPerfect*, a task that will involve a severe reduction in its size (in our 8MB system, with the default setting of a 96K cache, *ATM* fills 178K of RAM—more than any other Windows font

manager). Still, for simplicity, compatibility, and reliability, no Windows font manager matches it.

FaceLift

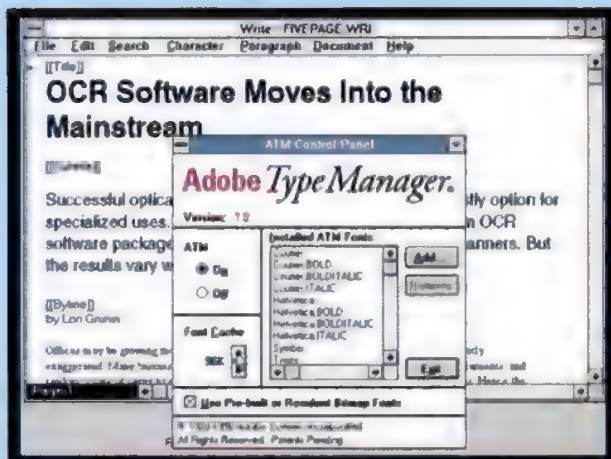
Bitstream's \$99 *FaceLift* brings to Windows screens and printers the work of the first and most distinguished all-digital type foundry, plus a wealth of features and conveniences. Bitstream's typeface library is perhaps the most consistently and subtly designed of all libraries available for the PC, and its faces comprise the largest range of characters and symbols. *FaceLift* uses the new Speedo typeface format, which is proprietary to Bitstream but which can be used with an increasing number of DOS applications in addition to Windows.

Thirteen typefaces come in the package, and you choose the ones you want during installation. Only 8 match the 13 standard PostScript faces. For text printing, you'll probably choose the four styles each of Dutch and Swiss (well-designed counterparts of Times and Helvetica). For serious spreadsheet work, you can add a fixed-width version of Helvetica, and if you enjoy light-hearted typography, you can choose from four decorative faces: Park Avenue, Brush Script, Cooper Black, and the lush Formal Script 421 (called Mermaid in earlier Bitstream incarnations). Once you've selected the typefaces, you simply restart Windows and let *FaceLift* supply screen and printer fonts to your applications. *FaceLift* provides on-the-fly font scaling under Windows 2.x or 3.0's real mode, as well as standard and enhanced modes.

FONTS GALORE

You can supplement *FaceLift*'s 13 supplied fonts with a \$199 Value Companion Pack of 24 additional fonts, including Bitstream's Amerigo and Charter faces, plus Century Schoolbook, Futura Light, and several decorative styles. You can also use fonts from any of Bitstream's 52 classic *Fontware* packages (each with four type styles for \$129). The most recent versions include outlines in Speedo format in addition to the original *Fontware* format, and you can upgrade older *Fontware* packages as well (this costs \$29.95 for the first package and \$14.95 for each additional package).

Bitstream also sells a \$179 Companion Pack for PostScript, which includes

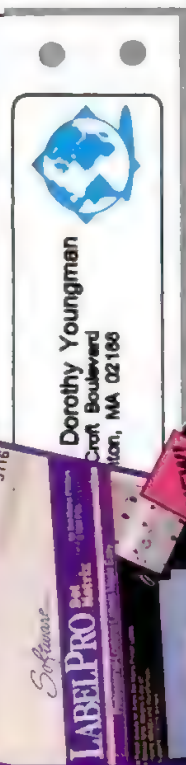


Adobe Type Manager's simple control panel lets you adjust the size of the RAM-based font cache and install new fonts. The screen fonts are notably smooth and readable even at VGA resolution.

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GRAPHICS WINDOWS FONT MANAGERS

Speedo equivalents of the 35 PostScript faces. This lets you use *FaceLift* for screen fonts to match the printer fonts in a PostScript printer (*FaceLift*'s native Dutch and Swiss fonts have wider characters than PostScript's Times and Helvetica), but it makes more sense to use *ATM* for that purpose. A more useful \$99 Companion Pack for the LaserJet III gives you screen fonts that match the widths of the scalable CG Times and Univers fonts built into HP's printer, with scalable Courier as a bonus.

Because *Fontware* uses a line-and-arc format while Speedo uses Bezier curves, you'll see some slight differences in the output between *FaceLift* and *Fontware*

versions of the same typeface. Speedo shares the honors for the best on-the-fly scalable type with *Adobe Type Manager*, and Bitstream's character spacing is superior to that of the very early PostScript fonts that come with *ATM*. Speedo fonts often look marginally rougher than their *Fontware* equivalents, with more jagged edges on diagonals and curves, and their character spacing tends to be less even. But the convenience of *FaceLift*'s on-the-fly font generation more than outweighs these quality differences.

Speedo outlines include kerning data, but *FaceLift* unfortunately doesn't let your *Windows* applications use it. *FaceLift* for *Windows* also lets you access only 190 characters from each typeface (*FaceLift* for *WordPerfect* lets you access about

THE NEXT GENERATION: Smoother Fonts On-Screen

by Edward Mendelson and Lori Grunin
Even with the best *Windows* font managers, the fonts on your screen have jagged edges at all sizes and are almost unreadable at small sizes. But today's plain-vanilla VGA technology will soon be incorporating an inexpensive chip that smooths out those rough edges.

All VGA cards include a RAM DAC (digital-to-analog converter) chip. The DAC on VGA and higher-resolution cards controls the conversion of the digital signal into analog red, green, and blue values; it also houses the color lookup table that the card needs to map colors between the total VGA palette of 262,144 colors and the maximum of 256 colors that can be displayed.

Edsun Laboratories' contribution to DAC technology is an inexpensive DAC chip that includes its Continuous Edge Graphics (CEG) anti-aliasing "shading engine." By using all 8 bits of the palette data register, the shading engine "shades" each pixel on the display to provide smooth transitions instead of the abrupt transitions normally found on graphics screens. In other words, instead of turning off an adjacent pixel, it chooses an intermediate shade, so that a diagonal line cutting across a series of pixels will be perceived by the eye as straight rather than jagged. Edsun claims that the new

chip makes *Windows* fonts more readable on a VGA monitor than they are today on monitors with twice the resolution without anti-aliasing.

These intermediate shades generally have to be made to order, and the extra processing inevitably slows down the display (though Edsun claims the overhead is very small compared with the benefits). And custom drivers are required to achieve the chip's fullest effects. But an upgrade to Bitstream's *FaceLift* will work especially closely with CEG-equipped video cards to produce anti-aliased screen fonts. And a new *Windows* driver in the works at Edsun promises to bring these improvements to all *Windows* fonts.

Edsun isn't the first to try to bring anti-aliasing to PC screens. ATI Technologies, for instance, has been demonstrating an 8514/A-compatible video card that uses a proprietary anti-aliasing method since 1988. But at press time, more than a year after the announcement, the ATI card still wasn't shipping. Edsun's chip, on the other hand, already has commitments for wide support, and it's expected to appear on several VGA-or-better cards and some PC motherboards by the middle of 1991. Edsun may just become the industry standard by default.

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*Lets you display TARGA image files.

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‡VGA700 also available with 812K and 256K memory configurations.



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350). But if you don't have a matching italic or bold for a Speedo typeface, *FaceLift* can slant or darken it.

COMPLETE CONTROL

FaceLift has more features than most *Windows* font managers, but it lets you ignore the more complicated ones. Installation is straightforward: You accept a few directory names and select the typefaces you want to install. Afterwards, you use a

control panel to install or uninstall further typefaces and access the program's multitude of options. One control-panel menu lets you turn *FaceLift* on or off for individual printers. Another lets you set a minimum threshold for screen scaling; below this threshold, *FaceLift* uses *Windows*' built-in fonts for greater legibility than you can get from on-the-fly scaling.

You can alter the size of the RAM-based font cache from the default 64K down to 16K or up to 20 percent of your available memory; a larger cache (try 384K or more) speeds performance noticeably. You can limit the number of cached fonts and set the maximum font size stored in the cache. With a 64K cache, *FaceLift* took up a total of 142K of RAM in our 8MB system.

Unless you tell it not to, *FaceLift* saves its font cache to disk when you exit *Windows* and loads it again on start-up. Without this on-disk cache, *FaceLift* is among the slowest of the *Windows* font managers; with the cache, it's one of the faster ones, except when printing. You can improve print speed, however, by generating and downloading LaserJet bit-mapped soft fonts.

One of *FaceLift*'s more arcane features lets you adjust print density to avoid smudged-looking output from dot matrix printers. Such adjustments aren't necessary with laser printers, but by deliberately misusing them you can achieve some special effects like outlines or shaded fonts.

The manual isn't as clear as it should be about the program's options. For instance, it doesn't tell you that if you switch *Windows* screen drivers (from VGA to 8514/A, for example) while *FaceLift* is active, the program won't run under the new driver. Before switching drivers, you have to turn *FaceLift* off; then, after you restart *Windows* with the new driver, you have to turn *FaceLift* on again, then close and restart *Windows* once more to make *FaceLift* start running. (As with *ATM*, you have to restart *Windows* after turning

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FACT FILE

FaceLift, Version 1.0
Bitstream Inc., 215 First St., Cambridge, MA 02142; 800-522-3668, 617-497-6222.

List Price: With 13 fonts, \$99; Value Pack (24 additional fonts), \$199; Typeface packages (4 fonts each), \$129. Companion Pack for PostScript (35 fonts), \$179; for the HP LaserJet III (11 fonts), \$99.

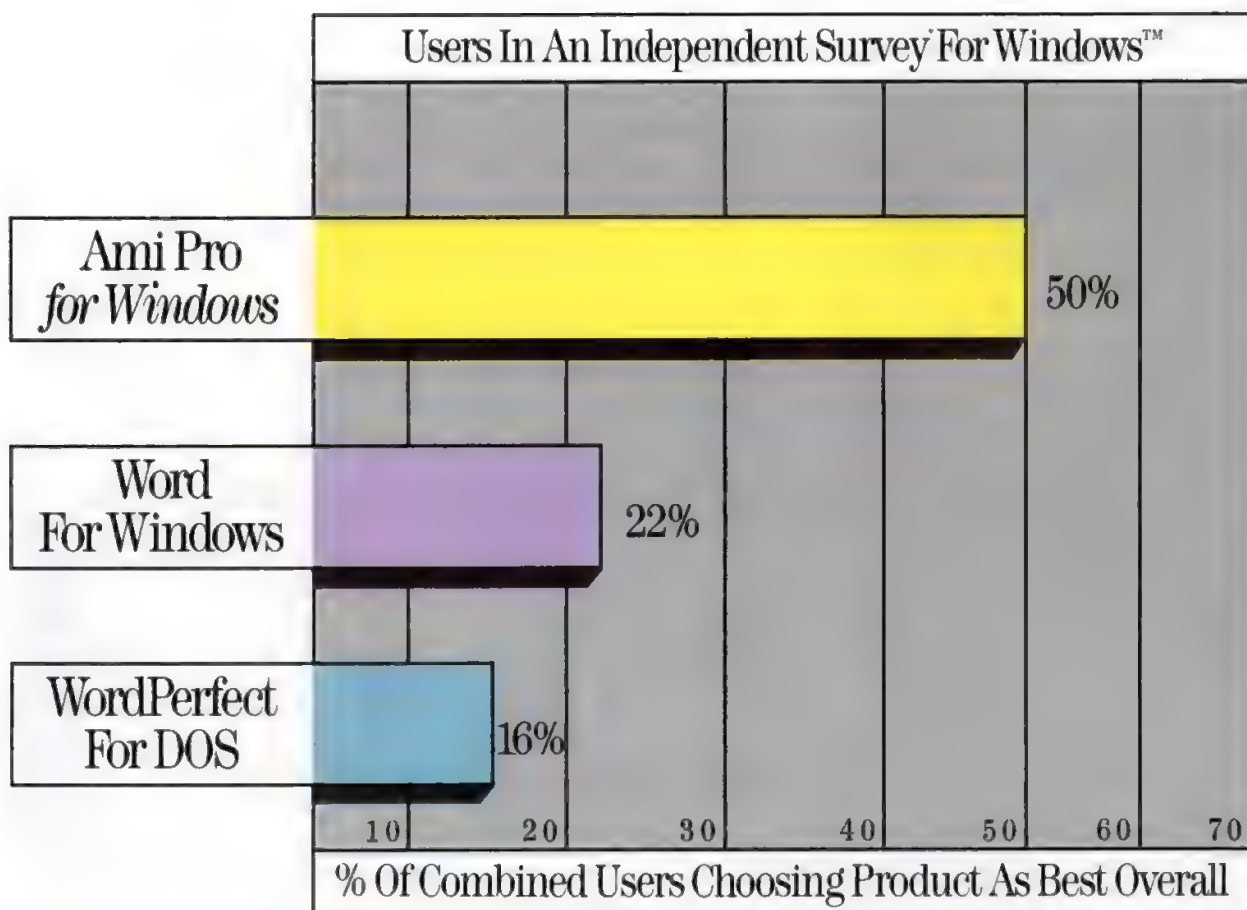
Requires: 286-based PC or better; 1MB RAM, hard disk; graphics adapter (EGA or VGA recommended); DOS 3.1 or later; Microsoft *Windows* 2.03, 2.11, or 3.0. Mouse recommended.

In Short: A *Windows* type manager that uses Bitstream's consistently well-designed typefaces in the Speedo format, *FaceLift* is rich in options—and complications.



CIRCLE 494 ON READER SERVICE CARD

There's only one word processor for Windows that's winning it all.



*Independently conducted Windows word processing Usage & Attitude Study, November, 1990. Figures cited are among Word for Windows users that are also users or triers of Ami Pro.

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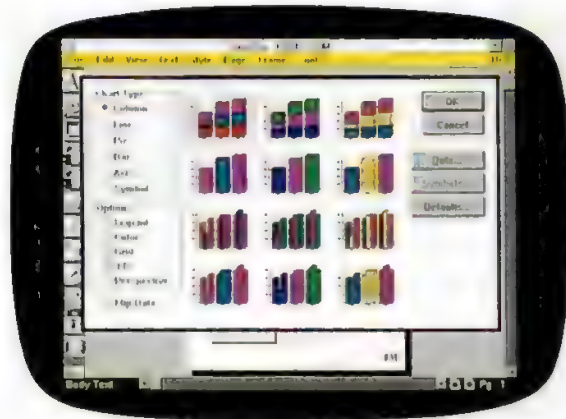
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Pick a winner.

Automatic Backup Automatic Timed Save Block Manipulation Bookmarks

- Named By User • Go To
- Charting**
 - 3D Charting • Edit Chart with Draw Tools
 - Legends • Multiple Styles Per Type • 7 Chart Types

Copy Text and Graphics Cursor Movement

- Begin/End of File • Character • Line • Page
- Paragraph • Sentence • Top/Bottom of Screen • Word

Customizable Icon Bar

- Choose From Over 45 Functions • Quick Access to Features

Customizable View Level

- 10-400% • Fully Editable

Cut and Paste

- Today's Date • Date Printed • Date Last Edited • Definable Style

DDE (Dynamic Data Exchange)

- Two-way • Paste Link • Text and Graphics
- Via Macro Language

Defaults

- Backup Options • Date Styles • Dictionary Paths • Display Options • Document Path
- Draft Mode Colors • Footnote Options
- Hyphenation Hot Zone • Pair Kerning • Printer
- Icon Bar Icons • Undo Levels • View Level

Delete

Dialog Boxes

Document Annotation

- Notes • Show/Hide • Go To Notes • Date/Time Stamp • Stacked Notes

Document Descriptions

- Author Name • Operator Name • Revision Number • Creation Date • Revision Date
- Renameable Fields • User Defined Fields
- Display with Directory • Print with Document

Drawing

- Cut/Paste Objects • Circles • Arcs • Squares
- Rectangles • Rounded Boxes • Diagonals
- Polygons • Polylines • Group Objects
- Snap-To Grid • Fill Patterns • Line Widths
- Text Rotation • Type Text

File Import/Export

- AdvanceWrite • ASCII • DBase • DCA Final Form • DCA Revisable Form • DIF • E-Mail
- Enable • Lotus WKS WK1 WK3 • Microsoft

- Word • Microsoft Word for Windows • Multimate • Navy DIF • Peachtext • Rich Text Format • Samna Word • Windows Write
- WordPerfect • WordStar • Wordstar 2000

File Management Functions

- Copy • Rename • Delete • Move • Sorted File Listing

Font Control

- Unlimited Number of Fonts • WYSIWYG
- Limited Only by Printer

Footnotes

- Auto Numbering • Bottom of Page • Endnotes • Number Style Option • Reset Number Option • Separator Line

Forms Capability

- Format Complicated Forms • Fill-In-On-Screen
- Print on Preprinted Form • Protect Areas

Frames

- Anchor to Text • Auto Text Wrap Around
- Background Shade • Contain Text or Graphics • Fixed Position On Page • Lines Around • No Text Wrap Around • No Text Wrap Beside • Overlay Frames • Repeat on Multiple Pages • Resize Frames

Glossary

- Large Record Size • Speed Key Access

Go To

- Any Page Number • Fast Next Item Access
- Go To Frame, Footnote, Note Various Marks in Document

Graphics Control

- Edit PIC Files • Drop Anywhere on Page
- Float Graphic w/Text • Place in Box • Proportional Scaling • Fit in Frame • Rotate in Single Degree Steps • X-Y Scaling • Gutter/Binding Margins

Graphics Import

- CGM • EPS • HPGL • Lotus PIC • PCX
- TIFF • WMF

Hard Space

Headers/Footers

- Alternating • Floating

Help

- CBT Tutorial Available • Context-Sensitive
- Indexed • Point & Shoot • Hypertext Linked
- Full Macro Documentation On-Line

Hyphenation

- As-You-Type • Soft Hyphen • Consecutive Hyphen Control • On Paragraph Basis • Hot Zone

Image Processing

- Control Brightness, Contrast of Scanned
- Gray Scale TIFF Pictures • Sharpen Edges

- Smoothing • Invert Image

Index Generation

- Generate from List • Mark in Text • Multiple Level Indexing • Hyper Links from Index Back into Document

Insert/Typeover

Kerning

Line Numbering

Line Spacing Control

Macros/Programming Language

- On-Line Macro Documentation • Record/Play • Assign to Function Key • Assign to Menus • Create Menus • Variables • If • Go To Statements • Case Statements • For/Next
- Prompt for Input • Subroutines

Math Calculations

Measurements

- Centimeters • Inches • Picas • Points

Merge

- From ASCII Files • From Comma Delimited Files • From DIF Files • From WK* Files • From dBase Files • From Ami Pro File • Label Print Function • Preview Before Print • Three-Level Boolean Conditional Record Inclusion

Open Multiple Documents

Page Breaks

- Manually Inserted • With Paragraph Style

Page Formatting Control

- Margins • Page Size • Snaking Columns
- Line Around Page • Line Between Columns
- Portrait/Landscape

Page Numbers

- Any Location on Page • Reset Page Number
- Five Formats for Number

Paragraph Styles

- Quick Access with Styles Box • With Function Key • Controls Font, Alignment, Spacing
- Page Breaks, Ruling Lines, Bullets, Numeric Format in Table, Hyphenation

Printing Color

Print Options

- Over 130 Printers Supported • Number of Copies • Page Range • Reverse Order
- Collate • Print Document Description • Crop Marks • On Preprinted Form • Printer Bin Control for First/Rest Pages • Portrait or Landscape

Real-Time Pagination

Revert to Saved Version

Search and Replace

- Case Insensitive • Forward or Backward
- Header/Footer/Footnote • Skip • Replace

- Replace All • Search for Style • Search by Attribute • Wildcards

Section Outline Numbering

- 6 Levels • Number Paragraphs • Numbered Lists • User-Defined Reset

Snaking Columns

- Up to 8 Columns • Column Balancing • On Screen • Variable Width • Variable Spaced

Sort

- Alphabetic • Numeric • Ascending • Descending • By Paragraph • By Word • By Number of Lines • 3 Levels—3 Words Within each Level

Spelling Check

- 130,000 Word Dictionary • Add to Dictionary
- Correct Multiple Occurrences • Entire Document • Selected Text • International Dictionaries • Rest of Document • Skip All Occurrences • Statistics Report • Unlimited User Dictionary Size

Status Line

- Column Number • Document Name • Insert/Typeover • Line Number • Page Number

Style Sheets

- 27 Professionally Designed • Control All Formatting in Document • Document-Only Styles • Global Styles

Tables

- Up to 256 Columns • Column Width Control
- Row Height Control • Auto Row Height
- Lines around Cells • Shaded Cells • Connected Cells • Formulas • Four-Function Math, Sum Function, Absolute/Relative Cell Address
- Insert Rows and Columns • Numeric Alignment and Formatting

Table of Contents

- 3 Levels • Separator Choice

Tags

- Center • Leader Dot • Left • Numeric • Right

Text Enhancements

- Bold • Double Underline • Initial Caps • Italic
- Lowercase • Overstrike • Small Caps • Subscript • Superscript • Underline • Uppercase
- Word Underline

Thesaurus

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Undo

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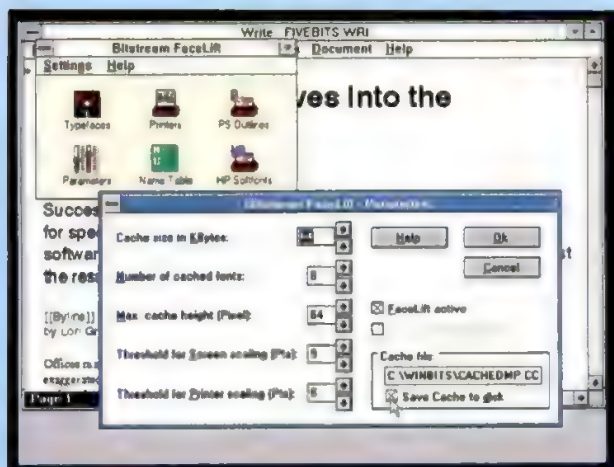
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CIRCLE 143 ON READER SERVICE CARD

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*Offer expires April 30, 1991. **The working model comes with its own Windows demo version and lacks some features including thesaurus, spell checker and ability to save files.



These are only a few of the fine-tuning options available from *FaceLift's* well-packed menus. Note the dark and well-characterized screen fonts.

FaceLift on or off.) None of this is complicated, but you have to know the secret in advance to avoid frustration.

COMPETITIVE ADVANTAGE

For LaserJet users who rely on DOS as well as *Windows* applications, *FaceLift* has one significant advantage over *ATM*: The Speedo fonts that you use with

FaceLift can also provide high-quality scalable LaserJet fonts for several major DOS applications. *FaceLift* for *WordPerfect*, for instance, is available now, and unannounced applications from Ashton-Tate, Borland, IBM, Lotus, Software Publishing, and others are expected to use Speedo outlines for printer fonts or screen fonts or both. You can't use Type 1 type-

faces with these applications unless you generate bitmapped fonts in advance, using Adobe's Font Foundry utility.

FaceLift won't work with *Windows' LaserMaster* driver, but you can use it with any PostScript printer. Thirteen hinted Type 1 PostScript faces that match the 13 supplied Speedo outlines are included in the package. This lets you use Speedo outlines for screen fonts while using Type 1 fonts for your PostScript printer, but this isn't much of a benefit; it's easier to use *Adobe Type Manager* to manage the the Type 1 outlines supplied with *FaceLift*, while using *FaceLift* to manage the typefaces available only in Speedo format.

When we tested it, *FaceLift* was clearly still at the start of its evolution (a free bug-fix disk to sort out problems that cause inaccurate screen displays in *Ventura Publisher* should reach registered users by the time you read this), and speed improvements are promised for future versions. But even as it stands now, Bitstream's *FaceLift* offers some of the finest and most convenient typography on the PC, and it is able competition for *Adobe Type Manager*.

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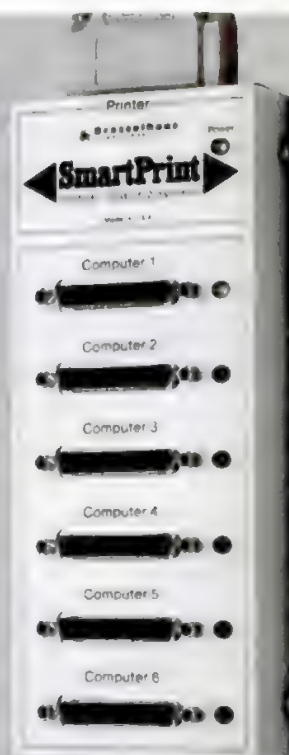
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PSS-S6	6	Serial	\$229

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GRAPHICS WINDOWS FONT MANAGERS

MoreFonts

Bored with black type on white paper? Then turn to MicroLogic Software's \$149.95 *MoreFonts* for type that's outlined in stripes or shadows, filled with stars, grids, or sunsets, and generally given a shot of typographical adrenalin. The same *MoreFonts* package can, of course, also give you ordinary black type in any of 14 styles out of the box, and you can buy more than a hundred additional styles available in MicroLogic's proprietary font format.

The basic *MoreFonts* package gives you scalable faces not only for *Windows* (in real, standard, and enhanced modes), but also for *LetterPerfect*, *Microsoft Word*, and *WordPerfect*. If you're willing to sacrifice special effects like stars and shadows, *MoreFonts* can generate scalable LaserJet III fonts for use with any application that supports the PCL5 (scalable) font format. You can also create and install PCL4 (bitmapped) fonts, complete with special effects, in *First Publisher*, *Microsoft Word*, *MultiMate*, *Ventura*

Publisher, *Windows*, *WordPerfect*, and *XyWrite*. For DOS applications, *MoreFonts* works only with LaserJets and compatibles, DeskJets, and dot matrix printers, but under *Windows* 3.0 it works with any *Windows*-supported printer.

MoreFonts gives you scalable fonts with special effects like grids, brick or wood-grain patterns, zigzags, plaids, and fogs, as well as fountains and various shades of gray. Your fonts can sport 3-D outlines or print in white against a patterned background. Most of *MoreFonts'* special effects are scalable, but some remain constant whatever the point size of the font; for example, the size of the grid in the graph-paper effect is the same whether you use the effect with a 6-point or 160-point font. Both the scalable and size-constant effects print with admirable sharpness and clarity.

FROM THE COARSE TO THE CRASS

You'll probably want *MoreFonts* mostly for its special effects, because the quality of its unadorned fonts falls far below that of *ATM* or *FaceLift*. The package comes

PC FACT FILE



MoreFonts

MicroLogic
Software, 6400
Hollis St., #9,
Emeryville, CA
94608; 800-888-
9078, 415-652-5484.

List Price: With 14 fonts (plus 11 more for registering), \$149.95. 20 add-on classic typeface families, \$69.95 each; any 3, \$99.95. 6 add-on display typeface families, \$99.95 each; all 6, \$149.95. Entire library of 26 add-on typeface families, \$299.95.

Requires: 1MB RAM, graphics adapter (EGA or VGA recommended), DOS 3.1 or later, *Microsoft Windows* 3.0. Mouse recommended.

In Short: Combining a DOS-based font-generation program with a *Windows*-based on-the-fly font manager, *MoreFonts* offers some nifty special effects, but the quality of its basic fonts is less impressive.



CIRCLE 425 ON READER SERVICE CARD

with coarse imitations of Times and Helvetica (here called Tiempo and Geneva); plus an ersatz Letter Gothic; imitations of the decorative faces Cooper Black, Broadway, Bodoni Bold Expanded, and

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Depending on specific OCR needs, you can use: (1) *omnifont only*, (2) *omnifont with learning* to "tailor" the OCR reading vocabulary, or (3) *learning only* for reading otherwise "impossible" documents which, with problem typefaces or photocopy blur, typically require typing.

It's the result of Adaptive Character Recognition,™ a breakthrough OCRON technology that boosts recognition accuracy and learning speed, yet uses less memory. And it reflects the kind of thinking that's given Perceive 1.1 other performance features, like the industry's fastest software-only omnifont, automatic detection and recognition of dot matrix print, and automatic separation of text columns and graphics.

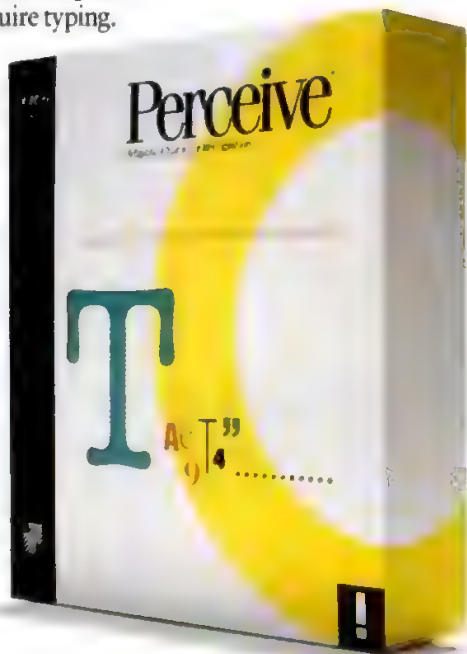
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WINDOWS FONT MANAGERS

Coronet Bold; and an especially silly version of University Roman, all in four styles each. When you register the package you get the italic, bold, and bold italic styles of the imitation Letter Gothic. By the time you read this, the package should be shipping with scalable versions of Courier and Garamond in four styles each, plus a utility that lets you convert any Type 1 font into the *MoreFonts* format. As with *ATM* or *FaceLift*, you can mix your printer's native, cartridge, or soft fonts on the same page with *MoreFonts*' own faces.

MicroLogic sells 26 packages of additional fonts: six packages of decorative "display" typefaces and 20 packages that

contain four styles each of a traditional "classic" typeface family. Each classic add-on package costs \$69.95, but any three cost only \$99.95, while the whole library of 26 typeface families costs only \$299.95—just a little more than \$10 per typeface. The quality of the add-on faces matches the decent but uninspiring quality of the ones that come in the box.

Once you install a *MoreFonts* printer driver and font set into *Windows*, it works smoothly and quickly—in some cases dramatically quicker than any other *Windows* font manager. Its RAM-based font cache changes size dynamically in re-

sponse to the number of fonts you use. In our 8MB system the driver and cache fill only 43K of RAM when *Windows* first loads; the size increases when you open an application and start generating fonts.

MORE DOS THAN WINDOWS

The *MoreFonts* font manager—as distinguished from its *Windows* printer and screen drivers—runs under DOS. The installation program adds a *MoreFonts* icon to *Windows*' Program Manager, but if you click on this icon you merely open a DOS window and run the *MoreFonts* manager.

To create and install a font set for *Windows* you must first install *MoreFonts*



WINDOWS FONT MANAGERS: SUMMARY OF FEATURES

Products listed in ascending price order

	Publisher's Powerpak	Adobe Type Manager	FaceLift	MoreFonts	SuperPrint
	\$79.95	\$99.00	\$99.00	\$149.95	\$195.00
FONT SUPPORT					
Number of fonts in basic package	30	13	13	26	22
Font formats:					
Adobe Type 1	■	■	□	■	■
Bitstream Fontware	■	□	□	□	■
Bitstream Speedo	□	□	■	□	■
Intellifont	□	□	□	□	■
Nimbus Q	□	□	□	□	■
Proprietary	■	□	□	■	□
Point sizes:					
Minimum	4	2	2	2	2
Maximum	500	2,000	550	999	900
Generates screen fonts:					
On the fly	■	■	■	■	■
To disk	■	□	□	■	■
Special effects	□	□	□	■	□
OPTIONS					
Font cache options:					
RAM-based cache	■	■	■	■	■
Minimum size	None	64K	16K	None	None
Maximum size	Limited by RAM	Limited by RAM	20% of RAM	Limited by RAM	Limited by RAM
Cache size adjustable	■	■	■	■	■
Disk-based cache	□	□	■	□	■
Can be disabled	N/A	N/A	■	N/A	■
Automatic kerning support	■	■	□	□	■
User can select scaling threshold	□	□	■	□	□
Program can be disabled:					
Globally	■	■	■	■	■
For individual printers	■	□	■	■	■
PRINTER SUPPORT					
Printers:					
Dot matrix	■	■	■	■	■
HP LaserJet II and III	■	■	■	■	■
HP DeskJet	■	■	■	■	■
Canon Bubble Jet	■	■	■	■	■
PostScript	□	■	■	■	□
Downloads HP PCL4 bitmap fonts	□	□	■	■	□
Downloads PostScript fonts	□	■	■	□	□

■—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

WINDOWS SOFTWARE

Adobe Systems Inc.	
Illustrator Windows 1.0	278
Adobe Type Manager 1.0	54
Adobe Type Set 1 or 2	55
Adobe Type Set 3	118
ATM Windows Plus Package	108
Aldus Corp.	
Aldus PageMaker 3.01	494
Aristocad	
More Windows 1.0	54
Asymetrix Corp.	
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Bell Atlantic Corp.	
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Microsoft Corporation	
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Micrografx	
Charisma For Windows	319

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Yourway For Windows	110
Publishing Technologies	
File Organizer	125
Reference Software	
Grammatik Windows 1.0	59
Samna	
Ami Professional	288
Softview	
MacinTax For Windows	74
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Ventura Publisher Gold 3.0 Windows	530



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Westlake Value Pack	61
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Software Publishing	
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Mouse Systems	
Omni Mouse II Bus Version	54
PC Mouse III Bus Version	89
TrackBall Mouse Bus Version	65
Z-Nix	
Super Mouse II W/ Windows 3.0	95

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Additional Fonts\$75



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EZ-Menu\$39

ThreadZ Software Design GroupFileF/X

FileF/X is a nimble alternative to the Windows Program Manager. Use it to launch applications, arrange windows, and maneuver effortlessly between tasks. Add your favorite applications and other utilities to a Task Manager menu. Plus you get a unique collection of Window tools like File Find, File Undelete, Text Search and more.

FileF/X\$74



Dariana WinSleuth or SystemSleuth

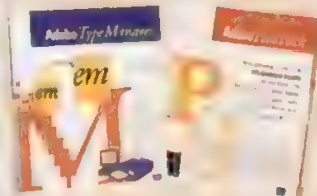
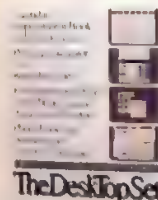
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Elite Business Apps

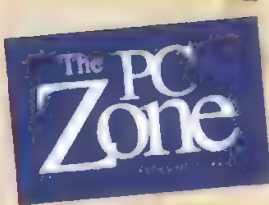
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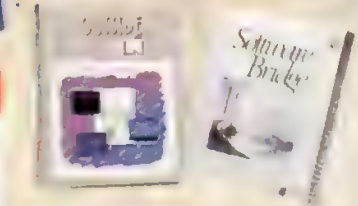


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Outside In\$57
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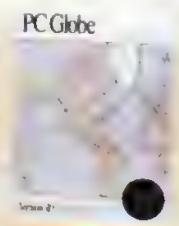
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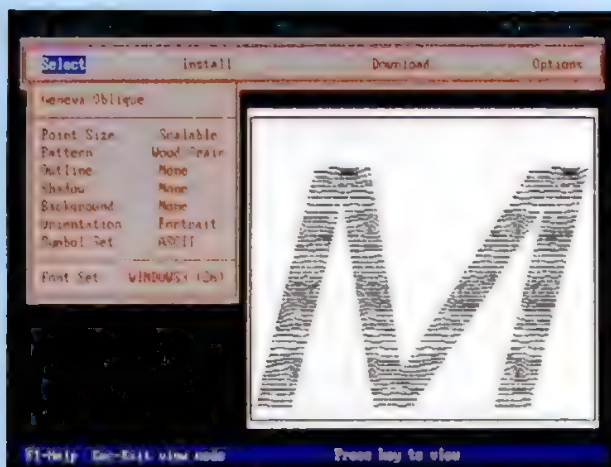
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You install fonts into *MoreFonts* by using a DOS program that can also display a sample of any special effects you choose to apply.

from the DOS prompt; then, again from the DOS prompt, run the *MoreFonts* manager without *Windows* loaded. If you try to install fonts by first running *MoreFonts* from within *Windows* instead of from the DOS prompt, *Windows* won't recognize the fonts—a wrinkle that's

standard symbol sets; if you select a non-*Windows* symbol set, *MoreFonts* can print out a keyboard chart to tell you which keys access which characters. When you create a special effect or a combination of effects like thin outline, drop shadow, wood-grain pattern, and black background, you can press a key to see an enlarged sample on-screen.

When you're through creating a font set, you then choose the application in which to install it, respond to a few prompts, and wait a couple of minutes while *MoreFonts* creates its font data and installs it. You can now run *Windows*, where your newly installed scalable fonts will appear on-screen. The *MoreFonts* printer driver lets you print to any *Windows* printer, including high-resolution PostScript and LaserMaster devices. Though the manual is unclear on the procedure for switching from the LaserJet or dot matrix printer that you selected in the *MoreFonts* manager to a completely different printer that you want to select within *Windows*, the menus are straightforward enough to make the job easy. If you select the *MoreFonts* printer driver from the *Windows* control panel, you can work your way down the menus until you see a screen that lets you choose the printer you want the driver to work with.

MoreFonts won't let *Windows* create an oblique version of a font for which no italic exists. For fonts that have no bold counterpart, *MoreFonts*' screen driver will display a pseudo-bold font on-screen if you select the bold attribute in an application, but appearances are deceptive: The printout will be in the normal weight with no bolding or emphasis.

If you're looking for the last word in font quality, you may decide not to look at *MoreFonts*. But if you're looking for scalable special effects for desktop publishing and decent fonts at reasonable cost for business applications, you may not need to look anywhere else.

Publisher's Powerpak

If you've been searching for loads of fonts at minimal prices, the \$79.95 *Windows* version of Atech Software's *Publisher's Powerpak* looks like the grail at the end of your quest. Compared with other *Windows* type managers, it's less than ideal for extended text passages, but it can be perfect for posters, flyers, and similar eyecatchers. And if you want scalable fonts for *Windows* screens and printers in non-Latin alphabets, it's virtually your only choice.

Atech makes versions of *Publisher's Powerpak* for *First Publisher*, *Microsoft Windows*, *Microsoft Word*, *Ventura Publisher* and *WordPerfect*; you can share scalable outlines among them. The *Windows* version includes a screen driver that works with most standard monitors and a printer driver that works with virtually any dot matrix, ink jet, or laser printer you've ever heard of (but not PostScript or LaserMaster).

The package claims to give you 30

The *MoreFonts* printer driver lets you print to any *Windows* printer, including any high-resolution PostScript printers and LaserMaster plain-paper typesetters.

almost impossible to find described in the manual. A menu option on the *Windows* Control Panel lets you remove fonts, but if you want to install additional fonts, you must return to the *MoreFonts* program running under DOS.

The *MoreFonts* program gives you a choice of typefaces, special effects, and font formats: either PCL4 (bitmapped) fonts, PCL5 (scalable) fonts, or *MoreFonts*' scalable format, which is the one you'll choose for *Windows*. You can create fonts with any of a large variety of



Publisher's Powerpak, Version 1.2

Atech Software, 5964 La Place Court, #125, Carlsbad, CA 92008; 800-748-5657, 619-438-6883.

List Price: With 3 type families in 10 variations each, \$79.95; Font Packs (with 2 type families in 10 variations each), \$29.95; Super Font Pack (11 type families in 10 variations each), \$79.95; foreign alphabets (2 typefaces each), \$79.95; Monotype Font Packs (4 typefaces each), \$79.95.

Requires: 286-based PC or better, 1MB RAM, graphics adapter (EGA or VGA recommended), DOS 3.0 or later; *Microsoft Windows* 3.0 required for on-the-fly font scaling. Mouse recommended.

In Short: *Publisher's Powerpak* offers a multitude of fonts at low prices, and is a good source if you need non-Latin typefaces for *Windows*, but it produces the least attractive type of any *Windows* font manager, and its handling of italics is poor.

CIRCLE 426 ON READER SERVICE CARD



COMPARING THE FONTS

by Beth Tondreau

It's important to remember that when you buy a font manager, you're buying fonts as well, and to choose accordingly. The power of the printed word greatly depends on the form of its letters. While only trained eyes fall upon the minute details that make certain fonts true to form, ill-conceived characters can subtly undermine the effect of the printed page.

Adobe Type Manager and Bitstream's FaceLift are designed for use with Adobe and Bitstream professional-quality fonts. These fonts offer a wide selection but are expensive. MoreFonts and Publisher's Powerpak, on the other hand, use their own less expensive type designs, but these may be less varied in choice and less certain in quality. SuperPrint

tries to give you the best of both worlds: It supplies Nimbus Q fonts at low cost but reads most industry-standard font formats. However, differences in font scaling and hinting technology can impose noticeable differences even between fonts generated from the same outlines.

To give you an idea of the aesthetic quality of the fonts, we show you samples of three typefaces from each of the five font managers in small sizes, handing out kudos, pointing out quirks, and ranking them according to their overall aesthetic success and historical integrity.

Our first two samples show the most popular serif face for business users—Times Roman—in both 10-point and 12-point sizes. Times Roman is popular for its high legibility and economy of space, but sloppy imitations can make this faithful servant dull or abominable to look at. Our third sample shows Helvetica (at 12 points), the most widely used sans serif typeface, much to the chagrin of some type experts who prefer hand-

somer alternatives. Finally, our fourth sample shows an alternative serif typeface (Baskerville, or the closest equivalent we could find) at 14 points, to show off some subtleties that aren't always apparent in Times Roman. Baskerville has round, readable characters that produce an elegant, open page. Innovative and under appreciated when John Baskerville first had it cut in the 18th century, it is now widely used, especially for long blocks of copy.

All the samples were printed at 300 dots per inch on a Hewlett-Packard LaserJet III printer, with its resolution enhancement turned on.

Beth Tondreau is a New York-based designer.

ADOBE TYPE MANAGER

Adobe Type Manager's Times Roman is a noble effort. The entire alphabet remains true to the design of the typeface, and, unlike Bitstream's versions, the 10-point and 12-point renditions are quite consistent with each other. Adobe Type Manager's Helvetica fares reasonably well and its Baskerville is quite handsome, though the dots over the "i" and "j" are meant to be round, not diamond-shaped as they are here.

Some small problems are apparent on closer examination. In the 10-point Times Roman sample, for instance, the lower curve of the capital "G" is noticeably flattened, and the curves in the "O" are also a bit shaky. In both sizes, in the lowercase "e," the curve thickens too abruptly below the crossbar. Finally, while Times Roman was designed to be compact, the lowercase letters in Adobe's version are a little too condensed, most noticeably on the lowercase "m" and "n." In the Helvetica sample, the top of the capital "M" should be flat, and the "r" and the "f" start to invade each other's space in the word "Hamburgerfonts." Still, Adobe's renditions are the best of this group.

ABCDEFGHIJKLMN OPQRSTU
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMN OPQR
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMN OPQR
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMNO
vwxyz
&1234567890
Hamburgerfonts

MOREFONTS

Oddly chiseled serifs

Curve missing

Curves lack thick and thins

Clumsy curves in capitals

Lowercase letters are very squat

Blotchy serifs

The quality of MoreFonts' proprietary fonts is noticeably lower than Adobe's and Bitstream's, with distorted and graceless letterforms. In Tiempo, its Times Roman equivalent, all of the capitals (especially the capital "O") are missing thick and thin dynamics, and the curves are labored and clumsy. The lowercase letters "u" and "v" are oddly and uncharacteristically chiseled, and the lowercase "e" has a very thick lower curve. Geneva (MoreFonts' Helvetica equivalent) shows similar problems: MoreFonts doesn't seem to negotiate curves very well, leaving the typeface looking expanded and squared-off, particularly in lowercase. Its Baskerville (called "Imperial") has odd blotches on the serifs, which look like club feet.

PUBLISHER'S POWERPAK

Publisher's Powerpak's Marin font doesn't look much like Times Roman, particularly in lowercase. The flag (the upper curve) on the lowercase "f" is amazingly long, the serifs on the "s" are too chiseled, and the lowercase "o" shows particular difficulty navigating curves. Dixon, its Helvetica equivalent, is also quirky: The leg on the uppercase "R" is an abrupt diagonal, lacking the characteristic curve, and the lowercase "r" looks compressed and distorted. The best of the lot is Baskerville, which is not surprising since it is derived from the Monotype library rather than Atech's proprietary designs. Powerpak's rendition of it is acceptably faithful, but spidery and a little graceless compared with the original cutting.

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890

Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890

Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890

Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890

Hamburgerfonts

Hamburgerfonts

Lower curve
should descend
below baseline
Serifs on capitals
have thickened up
Lowercase alphabets
differ markedly

Compressed and distorted
Top should be flat

Spidery

Quirky end serif

Exaggerated flag

Too expanded

Rocky curves

Too diagonal

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts

FACELIFT

Dots should be
round
Letter is too
square; diagonal
has a slight
curve
Needs better
spacing
Bloppy serifs
Spur on stem is
too rounded off

Bitstream's fonts are second only to Adobe's in quality, but their problems are more apparent. The 10- and 12-point Times Roman (which Bitstream calls "Dutch") are inconsistent with each other, especially in the lowercase alphabets. The 10-point version is actually a bolder font; it's thicker overall, with particularly heavy verticals. The 12-point version has its own discrepancies; the dots over the "i" and "j" should be rounder, and the serif on the right crossbar of the capital "T" has a chiseled-looking distortion.

The Helvetica (which Bitstream calls "Swiss") and Baskerville samples are marred by a blotchy appearance. In the latter, heavy blobs alter the clarity of the letterforms, making them look as if ink had collected in the serifs. In Helvetica, the line weights vary too much, producing a slight impression of thick and thin reminiscent of a serif typeface, while in the capital "G" of the Baskerville sample, the spur on the stem recedes much too quickly.

Distorted at top
and bottom

Serifs are too extreme

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts

SUPERPRINT

SuperPrint's native Nimbus Q fonts are about as good as MoreFonts' in quality: acceptable for the less picky but second-rate in comparison with Adobe and Bitstream fonts (which the program also supports). Nimbus Roman, for instance, has very little to do with the look of Times Roman. Both capital and lowercase letters are distorted and expanded in appearance, and the compact economy and readable regularity of Times Roman have been exchanged for quirky serifs and irregular letterforms. Nimbus Sans is not as irregular, and most of its letters escape great indignity. But its capital "M" is much too condensed, while the capital "S" is too expanded, and the lowercase "s" gets pointy at the curves.

SuperPrint does not supply a Baskerville font (though you can use Baskerville from other vendors), so we printed this sample using Century Schoolbook, another complex serif font. This particular Century Schoolbook is a bit lifeless overall, with the machine-like characteristics of a typewriter rather than the colorful appearance of a typeface with dramatic thick and thin strokes. The letterforms are lackluster and seem a bit squashed.

Irregular heights
Exaggerated flaglike
appendage
"M" is too condensed;

Pointy curves

Uppercase "O" is too
expanded

Curves on uppercase
"G" are too flat

Lowercase "u" is
widened and distorted

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts

ABCDEFGHIJKLMNQRSTU
vwxyz
&1234567890
Hamburgerfonts



For once, an announcement that will have businesspeople jumping into windows.

Until now, a lot of businesses have been hesitant to take the plunge into Windows. People have wondered, for instance, whether critical applications and viable communications would become available.

Well, if we may be so bold, we'd like to give you a little push — by introducing you to DCA's new IRMA™ WorkStation for Windows.

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It's easy. Just take a deep breath. Close your eyes, if you feel like it.

And jump.

DCA



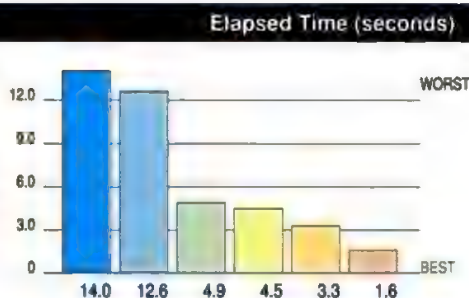


PERFORMANCE TESTS: WINDOWS TYPE MANAGERS

These type managers will slow you down, but the amount of the speed decrease depends on the size of the document and on the operation you are performing.

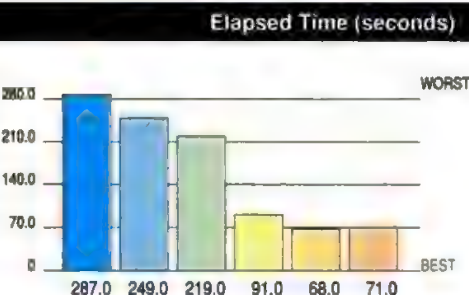
File Load

The **File Load** test measures the time it takes to load a 5-page *Windows Write* document formatted with the Times Roman and Helvetica typefaces. Text contains bold and italic passages, as well as a mixture of type in 10-point (body text), 14-point (subheads) and 24-point (headline) sizes. This test demonstrates the efficiency of the initial font-generation algorithms, but a large part of the raw time consists of disk I/O overhead.



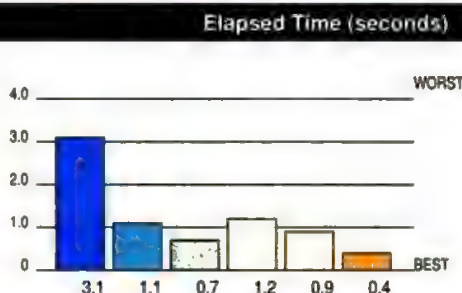
Document Print

The **Document Print** test measures the time it takes to print a 5-page *Windows Write* document formatted with the Times Roman and Helvetica typefaces, with bold and italic text in a mixture of 8-point (body text), 14-point (subheads), and 24-point (headline) sizes. To obtain the "no type manager" times, we printed the same document using the corresponding internal fonts of the LaserJet III.



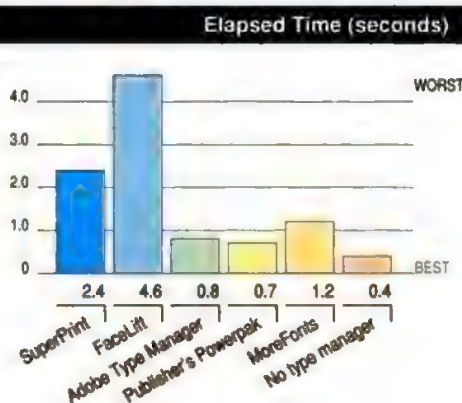
Type Size Change

The **Type Size Change** test measures how long it takes to change the phrase "From 'Gulliver's Travels' by Jonathan Swift" in a one-screen document from 10 points to 24 points (as if changing a piece of body text into a headline).



Block Typeface Change

The **Block Typeface Change** test measures how long it takes to change a paragraph of 10-point Times Roman type to 10-point Helvetica in a one-screen document.



typefaces, but these are actually ten variations on each of three typeface families: a Courier equivalent called Cobb, an imitation Helvetica called Dixon, and a spidery imitation Times called Marin. (If you find these names baffling, you can change them on one of the printer driver menus). The ten variations on the basic fonts are mathematically derived condensed, thin, wide, and expanded ver-

When you choose the italic or bold attribute in a *Windows* application, *Powerpak* slants or thickens the roman typefaces.

sions, plus hollowed-out equivalents of the solid-black faces. None of these variations is readable enough for standard text printing, although they're fine for flyers that announce a picnic or explain how to deliver the ransom money.

What you don't get are true italic or bold styles. When you choose the italic or bold attribute in a *Windows* application, *Powerpak* simply slants or thickens the roman typefaces. This is good enough for workaday printing, but far below the capabilities of packages that offer true italic and bold fonts. Another weakness of *Powerpak* is its insistence on printing lines of text almost unreadably close together (except in *Legacy*, *PageMaker*, and *Ventura Publisher*, which apparently refuse to accept *Powerpak*'s built-in spacing). You can correct the leading in most applications, of course, but you shouldn't have to. Though *Powerpak* creates screen fonts at top speed, they're probably the least readable of any *Windows* font manager.

A FOUNTAIN OF FONTS

You can supplement the typefaces in the package with Atech's \$29.95 Font Packs, each of which contains two type families in *Powerpak*'s ten standard variations. At present, 28 Font Packs are available, with more on the way. The Font Pack designs share the rough appearance of the built-in fonts and similarly lack true italics. A



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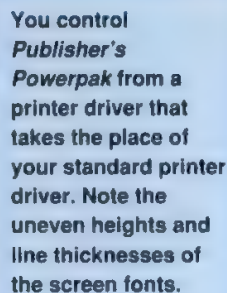
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Print rasterizes the entire page in your computer—graphics and all—before sending it to the printer. If you use one of the printers it supports, the result is improved graphics printing at increased speed. Since the program is responsible for generating fonts from outlines, it lets you work simultaneously with virtually every scalable font format available on the PC. The downside is that text printing is slower in most cases.

SuperPrint comes with printer drivers that work with LaserJets, DeskJets, PaintJets, Canon LBP laser printers, and most dot matrix printers. If you install *SuperPrint* for more than one printer, you can switch among them as needed. (Separate \$395 versions, not yet tested by PC Magazine Labs, work with color and high-resolution output devices like Presentation Technologies' Montage FR1, the Tektronix 4693DX, the Mitsubishi G650/G370/S340 series, and the CalComp PlotMaster or ColorView.)

The 22 included fonts prove *SuperPrint*'s flexibility: 13 Nimbus Q-format scalable outlines corresponding to the 13 basic PostScript fonts; four styles of Century Schoolbook (also from Nimbus Q); four styles of Futura in AGFA's Intellifont format; and Bitstream Charter in a format converted from *Fontware*. *SuperPrint*'s main menu lets you install further scalable outlines in all these formats, plus Type I and Speedo outlines. You can also install standard Hewlett-Packard PCL4 bitmapped fonts, although you can't scale them for the printer or create screen-font counterparts for them. And because *SuperPrint* rasterizes the entire page before printing it, you can't use any of your

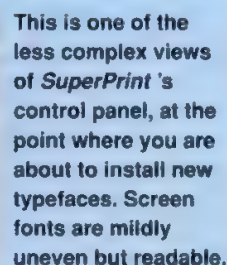
If you can't decide among PostScript Type 1 fonts, Bitstream Speedo or Fontware fonts, or maybe AGFA's Intellifont format combined with one or two other formats, indecision needn't stop you from choosing a font manager. Zenographics' \$195 *SuperPrint* lets you use all of them at the same time—and it's the only one of these *Windows* font managers that doesn't flicker distractingly while you're typing.

Unlike other font managers, *Super-*

You install *Powerpak* by running a batch file from the DOS prompt, and then configuring the *Powerpak* printer driver from the *Windows* control panel. The driver's menus let you choose your printer, create and choose among font sets, and turn on-the-fly screen fonts on or off. If you turn on-the-fly fonts off, another menu option lets you create *Windows* bitmapped screen fonts. Other options let you set the size of the font cache and the parameters for determining which fonts stay in the cache. On our system, *Powerpak* took up a mere 49K of RAM.

Powerpak can't create screen fonts as large as those created by other *Windows* font managers. In *Ami Pro*, for example, you get accurate fonts up to around 225 points; above that, you can specify a larger size but you'll still get 225 points. Above 300 points, you won't get on-screen scaling at all.

Powerpak's printer driver lets you print to a file, and you can tell it to write the file in a format that can be converted to PostScript for use with a high-resolution imagesetter (using another free-for-the-asking utility). The driver won't let you use any existing soft fonts or cartridge fonts that you may have bought for your laser printer. But with dot matrix printers, *Powerpak's* output is so smooth that you may actually prefer it to other *Windows* font managers.



Before

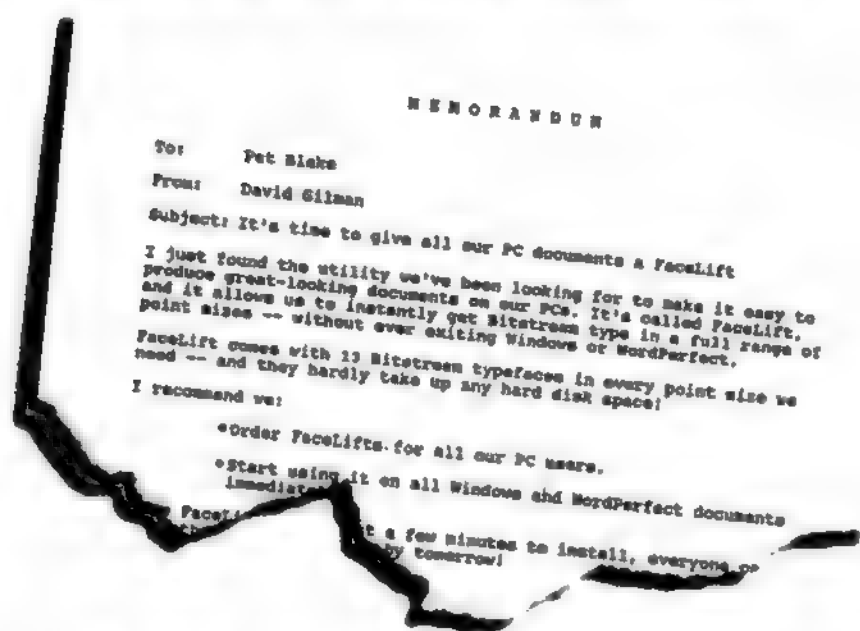


Until now, many desktop publishers found it too time-consuming to use the right typefaces and point sizes. Unfortunately, the end result was often too plain-looking for potential readers.

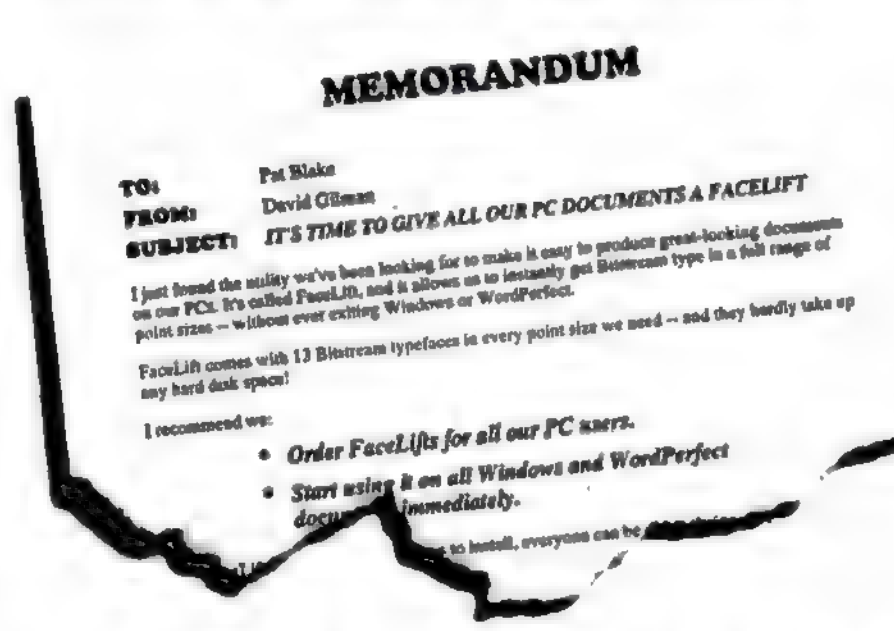
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GRAPHICS WINDOWS FONT MANAGERS

printer's cartridge or built-in fonts.

The first time you install *SuperPrint*, it generates a file of font information that it uses for internal housekeeping. Whenever you add new outlines or revise the names of the installed fonts, *SuperPrint* re-creates the font information file with laborious slowness (fortunately it does this in the background). *SuperPrint* also prints slowly, although printing, too, is done in the background by SuperQueue, a

replacement for Windows' Print Manager.

SuperPrint's font quality varies according to the typeface format used, but it tends to be noticeably inferior to the output from *ATM* and *FaceLift*. The Nimbus Q outlines that make up the bulk of the supplied typefaces are rough-edged and rather awkwardly shaped; the 22 additional PostScript-equivalent Nimbus Q

faces available in a \$195 SuperFonts add-on package are similarly substandard. *SuperPrint*'s renderings of Speedo and *Fontware* outlines are noticeably better, both because the outlines are better designed and because Zenographics has licensed Bitstream's technology for rasterizing Speedo and *Fontware* outlines.

SuperPrint also uses a licensed rasterizer for AGFA's Intellifont outlines, but Intellifont is a less effective technology

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SuperPrint, Version 1.1

Zenographics Inc.,
4 Executive Circle,
#200, Irvine, CA
92715; 714-851-6352.

List Price: \$195; SuperFonts (additional typefaces), \$195.

Requires: 286-based PC or better, 1MB RAM, hard disk, graphics adapter (EGA or VGA recommended), DOS 3.1 or later, Microsoft Windows 3.0. Mouse recommended.

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than Bitstream's, and the quality is no better than middling. For Type 1 outlines, *SuperPrint* uses a clone PostScript font rasterizer by Pipeline Associates that distorts the shapes of Adobe's typeforms. For example, the pointed vertical strokes at the top of the "m" and "n" are alarmingly exaggerated, and the rounded shapes of letters like "o" and "b" are distorted.

Type 1, Nimbus Q, and Speedo outlines can be imported directly into *SuperPrint* simply by selecting the filenames from a menu. Since *SuperPrint* displays the filename rather than the typeface name, however, you have to figure out which filename contains the typeface you want.

Fontware and Intellifont outlines must be converted from their original form before *SuperPrint* can use them. Supplied batch files do the job easily, but the converted outlines have baffling filenames that you'll puzzle over when installing them into *SuperPrint*. Because *SuperPrint* displays the names of installed typefaces, the easiest course may be just to install everything, then uninstall the outlines you don't need.

The only one of *SuperPrint*'s supported formats that you can't buy directly from its supplier is Nimbus Q. However, some applications use Nimbus Q outlines, and



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PREPARE FOR TAKEOFF

Manipulating *SuperPrint*'s various parts is as complicated as running *Flight Simulator*. The printer drivers and print spooler have relatively simple options. But the *SuperPrint* font manager—which you use to install typefaces, create optional bitmapped screen fonts, and modify a dozen other options—can be daunting. If you want on-the-fly screen fonts, the installation program causes the *SuperPrint* font manager to be started as an icon when you load *Windows*. If you click on that icon to manage fonts and then mistakenly close the program instead of minimizing it, the on-the-fly screen fonts will suddenly disappear from your applications, although the printer driver will still create them for the page.

Not all of *SuperPrint*'s parts fit together. For example, if you install a 12-point PCL4 bitmapped Baskerville font into *SuperPrint*, your applications' font menus will let you choose Baskerville in any size, just as if it were a scalable font. If you try to print with 14-point Baskerville, however, the result may be unpredictable. It may be an Unrecoverable Application Error message, with the loss of anything in your file that you haven't saved. Or it might be a page with roman type printed in 12-point Baskerville but italics printed in one of the *Windows* vector fonts at 14 points.

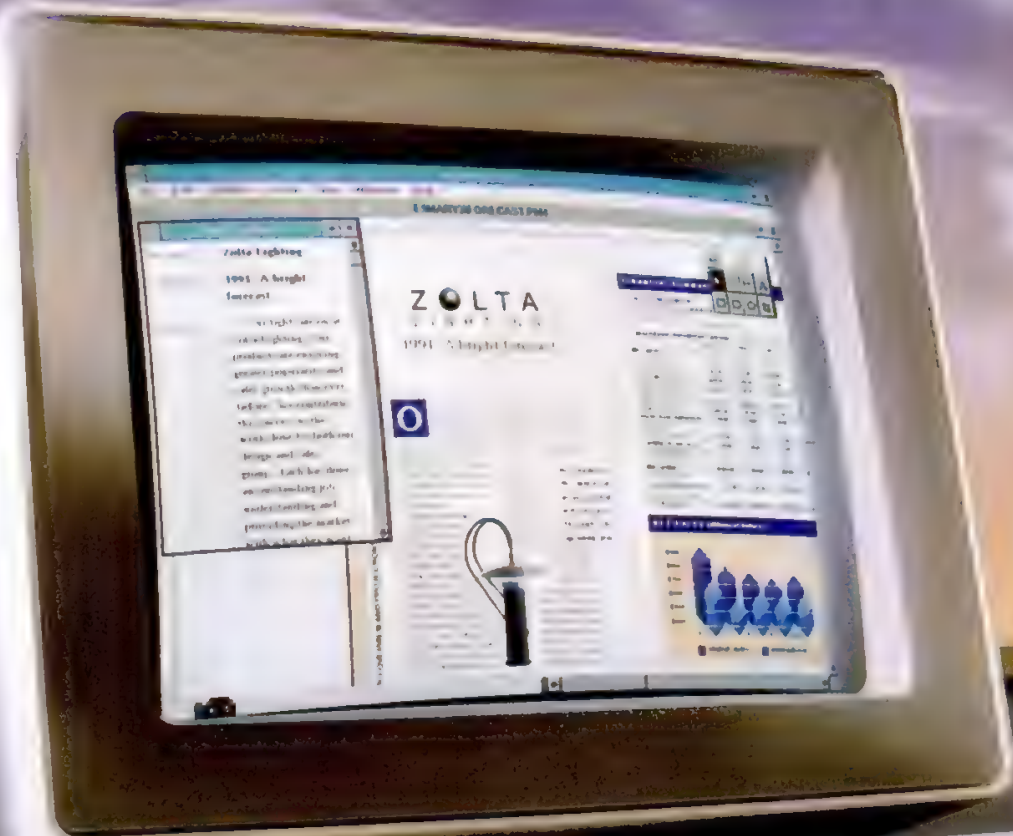
SuperPrint integrates itself smoothly into *Windows*, and, unlike the other on-the-fly font generators, stores its screen fonts in standard *Windows* screen-font format to eliminate flicker. *SuperPrint* also lets *Windows* adjust the size of its font cache in RAM, as well as the size of the default 500K font cache on-disk. With all its functions, *SuperPrint* filled only 78K of RAM in our 8MB system.

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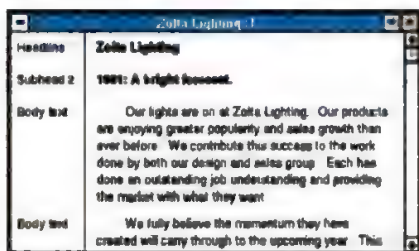


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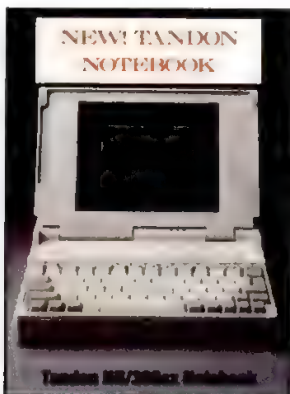
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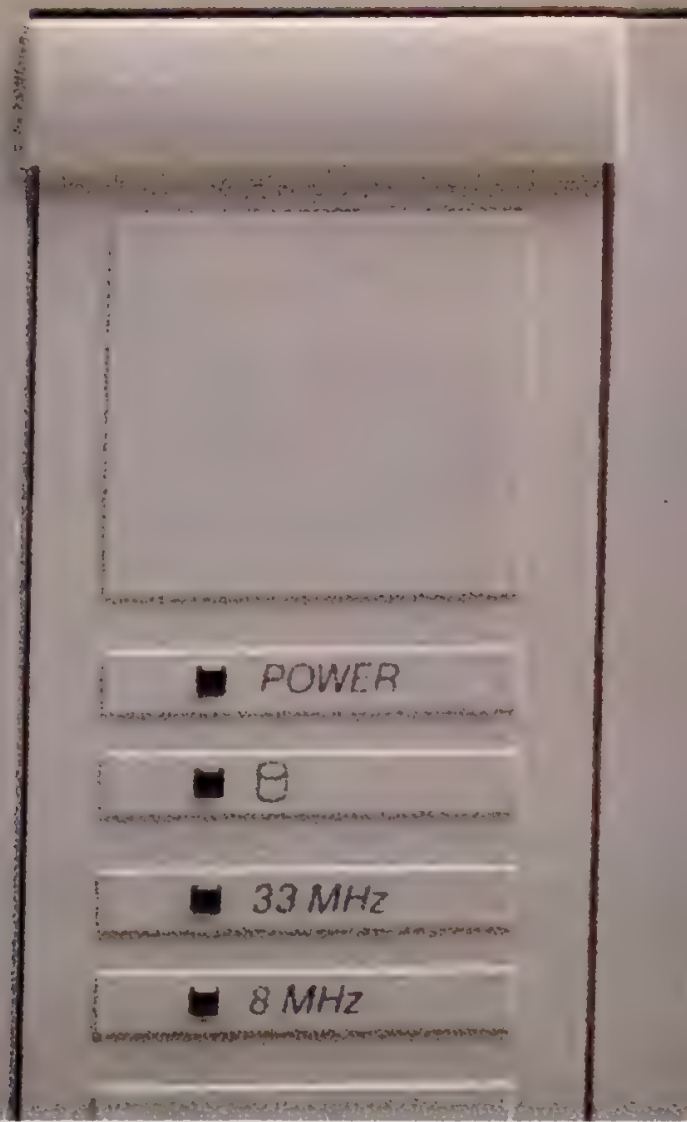
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These 22 33-MHz 486-based PCs show that the EISA bus, combined with high-powered cached peripherals, makes a real difference in PC performance.

Unleashing EISA's Power

by Winn L. Rosch

Finally, EISA delivers. Now that high-performance peripherals are available, the better bus can give a speed boost to your next PC—not just a paltry few percent, but a true rush of mass storage throughput.

With the EISA bus, caching, and a coprocessor-based SCSI disk controller, you can achieve disk performance on PC Magazine Labs' benchmark tests that is easily twice as fast (and occasionally ten times as fast) as an AT-bus computer with the same microprocessor and megahertz rating.

No longer are we hard-pressed to recommend an advanced expansion bus. The latest crop of 33-MHz 486-based PCs ably demonstrates that EISA can make a definite contribution to your next computer's performance.

Certainly these benefits have been a long time coming. When it was announced in August 1988, the Extended Industry Standard Architecture promised so much that it could have been mistaken for a candidate seeking political office. Its wealth of system-enhancing technologies could seed a buzzword dictionary: bus mastering, interrupt sharing, 32-bit bus width, high-speed transfer modes, and automated setup, just for starters. EISA promised to accelerate the performance of just about any peripheral you could plug into a PC.

Yet until the release of this current batch of high-powered hardware, EISA systems came nowhere near delivering on the promises the vendors had made. The costs were disproportionately high, too: The first EISA machines demanded a \$2,000 premium over their AT-bus (or ISA) kin.

Today, the price differential is evaporating while the real benefits finally coalesce. Although not all of the promises of EISA technology have yet been fulfilled, you can begin to see an immediate payoff for your investment in the advanced bus when you run real-world applications.

The difference today is the availability of expansion boards, such as network adapters and hard disk controllers, that take advantage of at least some of EISA's advanced capabilities. A case in point is bus-mastering hard-disk controllers. These adapters take direct control of the bus for data transfers, freeing up the microprocessor for other tasks.

Thanks to this new hardware, on PC Labs' DOS File Access test the great majority of the 33-MHz 486-based EISA machines reviewed here came close to doubling the speed of the 33-MHz 486-based ISA-bus PCs we reviewed earlier this year ("33-MHz 486 PCs: Maximum Performance," *PC Magazine*, February 12, 1991). The best of the controllers—the Mylex DCE376 SCSI host adapter, which includes up to 4MB of cache RAM—pushed disk performance to a level few other PCs have reached. But the cache will cost you: With 4MB of RAM, the board wholesales for anywhere from \$783 to \$880, which is about \$200 to \$240 more than the same board with no cache.

Granted, all of the improvement can't be attributed solely to EISA technology. The ISA-based machines that we reviewed earlier lacked the hardware-based disk caching included in most of the bus-mastering EISA disk controllers in this re-

view. But the higher transfer rates that EISA affords can better capitalize on the power of a cache.

In fact, the performance advantage of

cached 32-bit bus-mastering controllers was so pronounced that to keep the competition in this review fair, we've limited our evaluation to products that come factory-equipped with true bus-mastering EISA hard disk controllers. Some 33-



EDITORS' CHOICE

- Compaq 486/33L
- Tangent Model 433e
- Zeos 486-33 EISA

Of the 22 EISA-based 33-MHz 486s in this roundup, the Compaq 486/33L, Tangent Model 433e, and Zeos 486-33 EISA win Editors' Choice. Zeos and Tangent performed best on our tests, and they offer the best overall packages; the uncached Compaq performs better than many of its cached competitors and thus deserves Editors' Choice.

If you're looking for a company with long-term experience in the EISA market, your only choice from this batch is the Compaq 486/33L. The leader of EISA's original Gang of Nine (with AST, Epson, Hewlett-Packard, NEC, Olivetti, Tandy, Wyse, and Zenith), Compaq is committed to using this architecture for all its new high-end systems. Don't look for the fastest performance or the lowest price; among other 486/33s, Compaq's scores are conservative and its price (before a 30 percent dealer discount) reaches \$19,846 for our standard configuration, including a 320MB hard disk. Also, you'll be locked into a VGA display, not Super VGA (unless you spend even more for 1,024-by-768 resolution). But if you have the budget and you need a sure thing, the Compaq delivers consistently.

Zeos has the great performance the company strives for. The combination of a Seagate SCSI hard disk and Mylex caching disk controller makes this system soar through all of our disk tests. And though expensive, the package offers good value, with a list price of \$7,120 for a system in our standard configuration, with 200MB of disk storage space, two floppy disk drives, DOS 4.01, and *Microsoft Windows 3.0*. Zeos admits that it is new to the EISA market, but its

reputation for good customer support (including a 24-hour toll-free support line and on-site service from TRW) should ease your concerns.

Like the Zeos 486-33 EISA, the Tangent Model 433e excelled in its performance, topping our Floating-Point Calculation benchmark test, sharing the top score on the 80486 Instruction Mix test, and showing superior disk and video scores. The \$9,690 price tag includes a 329MB hard disk and Mylex caching disk controller.

Proteus and Tandon produce 486/33 EISA systems in such small quantities that it's hard to tell how easily you can get your hands on one of their systems. Still, both merit honorable mention for their superb componentry, design, pricing, and performance.

You can't beat the value of the Proteus 486/33 EISA at \$5,695, including a 200MB ESDI hard disk and Super VGA color display. Only Proteus fits all its components (including the full-sized motherboard) into a mini-tower case. You might feel limited if you want a wide range of storage devices in a file server, but for CAD applications this system is a beauty.

Tandon's ground-up approach to building PCs, combined with its machine's outstanding disk test scores, earns the Tandon 486/33 EISA honorable mention. The company has designed its own motherboard, BIOS, and cache architecture, and the name-brand components it gets from outside sources make this computer among the fastest in its class. At \$10,047 for a system with a 330MB SCSI hard disk and a Mylex disk controller with 4MB of cache RAM on-board, this is expensive but worth the price. ■

MHz 486 EISA computers currently are not shipped with these high-performance controllers (for example, the Dell 433e) and consequently were not included in this review.

Despite the demonstrable improvements in benchmark test performance made by this controller technology, the best of the better bus design still lies ahead. EISA is a bundle of technologies, and most of today's quicker controllers only cash in on a single performance-improving aspect of the standard, EISA's 32-bit connections (the classic AT bus limits data transfers to 16 bits). Waiting in the future are applications that implement EISA's higher-speed modes and allow data transfer rates of up to 33MB per second (the AT bus is limited to about one-quarter of that speed).

The true power of bus mastering, too, won't be realized until a new generation of software becomes available, including software drivers that are capable of bringing the advanced modes to life and versions of operating systems that will be able to take advantage of this technology. The multitasking abilities of OS/2 and Unix make EISA versions possible, but neither is here yet.

Nevertheless, the EISA benefits that are already realized put it ahead of the AT bus, and those performance-enhancing capabilities should soon be migrating into other peripherals besides disk controllers. For example, the availability of full 32-bit graphic coprocessor boards was only weeks away when this article was written. At least five vendors, including Cogent Data Technologies, The Madge Networks, Mylex Corp., Novell, and Proteon, manufacture EISA network adapters. (See "32-Bit LAN Adapters Break I/O Bottlenecks," *PC Magazine*, May 29, 1990.) Each new product announcement helps fulfill a bit more of the EISA promise.

CLOSING THE PRICE GAP

Although manufacturers have trimmed the price tags of their EISA systems, comparing the machines in this review with AT-bus systems shows that EISA's peppy performance still costs more. Exactly how large a premium you'll have to pay to get EISA in your next PC is hard to calculate: Rarely do you have your choice of two computer models that are identical in microprocessor, speed, memory, and other features but differ in expansion bus. Yet the greater cost of EISA is unmistakable; the range is \$500 to \$1,000.

The new bus itself is not the principal culprit anymore. In these machines, a significant part of the price difference results from the cost of the advanced-technology caching disk controllers. Deduct controller cost and you'll see that the cost of EISA is quickly converging on the price of AT-bus machines.

Even the remaining difference is on the decline, for some subtle reasons. While some industry insiders point to the imminent competition in the EISA chip set market as the underlying cause of the price decline, that's only part of the story; the price of chips is a small fraction of the premium you pay for EISA hardware. The current price of the Intel EISA chip set—the only one currently available—is

about \$110. Even if new chip sets undercut that by half, the retail price of EISA PCs won't move far.

Most of the remaining EISA price differential can be attributed to the added complexity of the EISA design. EISA simply takes more circuitry. But within the next year that situation promises to change radically, moving EISA even closer to AT-bus hardware in terms of cost.

The current Intel EISA chip set requires about 95 integrated circuits (ICs) for support, necessitating a full-size AT system board with about 160 square inches of board space. (All machines in this review had full AT-size system boards.) By contrast, many of today's ISA computers now use small-footprint motherboards measuring about 120 square inches and stuffed with a skeleton silicon crew; in fact, several chip makers have reduced the complete electronics of an ISA computer to fewer than a dozen chips. Such frugal designs can shave hundreds of dollars from the cost of a machine.

By the time this story appears, Intel is slated to introduce its second generation of EISA chips, which will require only 40 support ICs. The chip sets being prepared by other manufacturers, such as Texas Instruments, are likely to be equally undemanding in their support requirements. Consequently, future EISA machines will suffer even less of a price disadvantage.

You could wait for the savings; figure at least six months for the new chip sets to trickle down to actual products. But when it comes to getting the computer power you need, an EISA machine on the desk is worth two on the drawing board.

FIRST UNCERTAIN STEPS

With any new technology, compatibility is always a concern. In the case of EISA computers, the big questions are how well the actual hardware conforms to the new standard and how well the systems handle AT-bus boards.

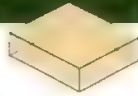
Every system we reviewed came with an ISA video card and an EISA hard disk controller. Although the published EISA specification does allow a degree of flexibility, we had no problem in getting these machines to operate with both AT-bus and EISA plug-in boards.

More ominous rumors about compatibility arose at Fall Comdex in 1990. According to circulated reports, most EISA machines contained a number of

INTERIOR CONFIGURATION KEY

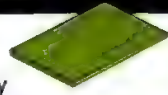
CASE

Cases typically come in five sizes: full desktop (shown here), full-height small-footprint, half-height small-footprint, tower, and mini-tower.



MOTHERBOARD

EISA motherboards are almost always full-size and generally take up the entire case.



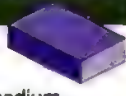
EXPANSION BOARD SLOTS

For the purpose of these diagrams, all slots are represented by full-size boards.



POWER SUPPLY

Power supply options fall into four categories: large (shown here), medium, small, and long and narrow.



DRIVE BAYS

Drive bays typically come in four different sizes: full-height (shown here), half-height, one-third-height, and 3.5-inch size.



EXTERNAL PROCESSOR RAM CACHE: How Much Is Enough?

by Bill O'Brien

All too often it seems necessary to load high-end state-of-the-art computer systems with every option available. In an 80486 environment, that typically means large ESDI hard disks, at least 8MB of high-speed DRAM memory, and as much external SRAM cache as the system can carry and you can afford.

Although good cases can be made for large hard disks and fast DRAM memory, expanding your processor RAM cache to its maximum size appears to be a tradition held over from 80386 systems. In fact, the *type* of external processor RAM cache may be more important than *how much* RAM cache you have.

Intel's 80486 processor already contains 8K of internal cache, and the debate rages as to how much external cache is really necessary. At somewhere between \$20 and \$40 per SRAM chip—depending on the chips' speed (typically 15 to 25 nanoseconds) and size (8K, 32K, or 64K)—filling out a 256K external processor RAM cache with SRAM chips can increase the cost of your computer by 2 to 8 percent.

Newer cache designs assist the 80486 in achieving prominence over its older cousin. External cache systems on the 80386 were often designed as *direct-mapped* systems, achieving a one-to-one correspondence with cached locations in the computer's memory. A direct-mapped cache is an easy and relatively inexpensive sys-

tem to design because it can be implemented using an array of discrete integrated circuits to manage the cache, instead of a dedicated cache controller like Intel's 82385.

Intel's 80486 uses a cache scheme called *four-way set associative*. In this design, the internal 8K of cache (governed by an internal controller) is di-

Intel's 80486 uses
a cache scheme
called *four-way set
associative*.

vided into four 2K blocks. Each block contains 32 sets of 4 lines, and each line is 16 bytes wide. Each set in the cache holds data for a given location in memory. When the 80486 needs to access memory, the cache looks at the set assigned to the appropriate memory location to determine whether the data has indeed been cached. Some 80386DX manufacturers use the 82385 chip, but they implement *two-way set-associative* cache, which is faster than direct mapping but slower than four-way cache.

Intel claims that its 8K internal cache using set-associative techniques is as effective as 32K of cache using the direct-mapped method. For the 8K

internal cache, the hit rate—that is, the percentage of data requests that can be satisfied with data found in the cache, as opposed to data that must be retrieved from system RAM—is estimated at 90 percent. Nine times out of ten, when a memory read is to be made, the data will be found in cache.

As a way of testing a given cache's effectiveness, we ran our Floating-Point Calculation test on an American Megatrends Inc. (AMI) 486/33 EISA motherboard with 4MB of system memory. This test, which represents a 27K segment of PC Magazine Labs' benchmark test suite, sets up a floating-point library in memory and accesses it while it executes. There was no measurable difference in the execution time for this test whether the motherboard's 256K of cache was enabled or disabled.

The processor's 33-MHz operating speed can be thanked in part for that demonstration. With the system toggled down to 20 MHz, the Floating-Point Calculation test performance went from a 10.75-second execution time with cache enabled to a 13.42-second time with the cache disabled. That 20 percent improvement with caching in effect is substantial; it indicates that the test segment did exceed the 8K internal cache. But remember: There are no 20-MHz 80486-based computers, and the 33-MHz speed negates the effect of the additional cache. The faster a processor performs, the less it depends on the effectiveness of the cache. ■

bugs that prevented them from operating properly. In tracking down these rumors, we found most were based on the premise that the Intel EISA chip set did not support all of the features in the EISA specification. In particular, the claim was made that these chips did not allow the use of EISA's enhanced 33-megabit-per-second data transfer mode.

According to Intel, these rumors are false. The current chip set, introduced in July 1989, fully conforms with the EISA specification and supports all documented EISA features. Although early engineering samples of first-generation parts may have had problems, Intel claims that all

chip sets it has sold fully implement EISA.

During our tests, another compatibility concern arose. Of the 26 PCs included in this review, seven were initially received at PC Labs equipped with beta-level BIOSes. That is, the BIOS of each of those machines was still being debugged.

Before the review process was completed, however, five of the seven manufacturers had supplied us with the official shipping version of the BIOS. The manufacturers of the last two BIOSes certified that there would be no functional or performance differences between the beta BIOSes and the shipping versions. After the production BIOSes were installed, no

compatibility problems were detected in any of these PCs.

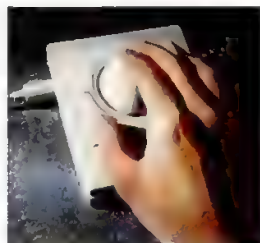
To help safeguard you against similar surprises and to assure that you stand a reasonable chance of buying a system that actually matches one you read about here, we added a new selection criterion in choosing the machines for inclusion in this review. We required each manufacturer to have shipped at least 50 units of the model reviewed here and to be able to build and ship at least ten units per month. Nearly half of the 48 vendors who claimed to be manufacturing such systems either could not meet these minimal volume requirements or missed our deadline.



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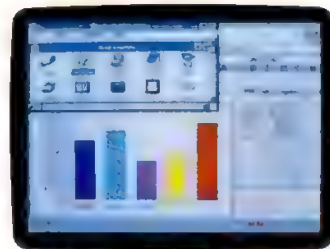
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Smaller sales volumes tend to indicate custom-built computers—made-to-order machines designed to suit the requirements of a particular user. While such PCs can be a convenience and are often bargains, they make reviews misleading. The machine you read about in a review may bear little resemblance to the one delivered to your doorstep.

SELECTING EISA

EISA technology does not significantly change your overall concerns in selecting a PC. Bus considerations are minimal. In fact, the most significant expansion-bus difference found between the machines in this review was the allotment of EISA and ISA slots. In some machines all slots were equipped with full 32-bit EISA connectors (which, in line with the EISA specification, also allow the use of 8- or 16-bit ISA boards). Other vendors, however, designed to include one or two traditional ISA slots with 8- or 16-bit capabilities.

There's one good reason to look for these old-bus slots. Some expansion boards have skirts that the long EISA connector may interfere with. An 8-bit slot will allow you to use a skirted expansion board. Otherwise, there's one good reason to avoid the old-bus slots: Because these slots lack the full complement of EISA signals, they do not fit EISA's automatic configuration system.

Beyond the expansion bus, you should choose among these machines much as you would among any other class of PCs. Choose a package—tower or desktop—that suits your expansion needs. (Because of their large system boards, EISA machines currently don't fit small-footprint packages.) Disks, ports, and peripherals should be judged as they would for a conventional PC.

REVIEW CRITERIA

To keep the competitors in this review well matched, we asked each manufacturer to deliver a standard product that came as close as possible to these requirements: 8MB RAM, a 200MB to 300MB hard disk and bus-mastering EISA controller, at least one 1.2MB or 1.44MB floppy disk drive, at least one parallel and two serial ports, a Super VGA graphics adapter and color monitor, and DOS 4.01. We gave vendors the option of including an external processor RAM cache, though we didn't require it, as the 80486 microprocessor includes a built-in 8K cache and a coprocessor.

We received such systems from 22 vendors. In this roundup, you'll see reviews of 33-MHz 486-based EISA PCs from ACMA, Advanced Logic Research, Amax, Bus Computer Systems, C² Micro Systems, Compaq, Dataworld, Dyna Micro, Fortron, HiQuality Systems, International Instrumentation, Matrix, National Micro Systems, Netis, Panther Systems, PC Pros/Touche, Proteus, SAI, Tandon, Tangent, Wedge, and Zeos. AT&T sent us a nonworking system and could not ship replacement parts in time for our deadline. Arche Technologies was starting to manufacture an EISA 486/33, and Everex had announced its 33-MHz Step Cube, but neither was ready to ship a production unit.

The features in all 22 reviewed systems put them squarely in server territory, as do their prices. Hardly by coincidence, the superlative disk speed of these machines places them among the fastest file servers and graphics workstations you can buy. That's where the power of EISA can best be put to use today.

If you need the best performance available and have the budgetary stamina to acquire one, there's no reason not to put one of these EISA engines on your desk. They're excellent machines today, and as more high-performance peripherals become available and software learns how to take advantage of them, they will only get better.

ACMA COMPUTERS INC.

ACMA 486/33 EISA

by Bill O'Brien

ACMA Computers' foray into the EISA environment is ably represented by its flagship system, the ACMA 486/33 EISA. This tower machine, with 8MB of RAM, a 360MB ESDI hard disk coupled with an UltraStor H22C caching disk controller, and a Super VGA display subsystem, commands a healthy \$7,995—but still manages to come in well under the \$9,000 level that seems the norm for EISA technology. Dropping some of its high-tech frills can even get your foot in the door at under \$6,000, if you'll settle for 4MB of system RAM and a 150MB IDE hard disk and switch from a Seiko 1450 monitor to a NEC MultiSync 3D. Even this lower-priced system is hardly a slouch.



ACMA 486/33 EISA, \$7,995.

The components used in its 486/33 EISA are standard among the group of computers we reviewed. The tower case is a six-bay unit with the usual assortment of front-mounted controls and LEDs. But ACMA has gone one step further than most and equipped the box with a hefty 450-watt power supply from PC Power and Cooling.

ACMA's motherboard of choice is manufactured by Free Technology; it utilizes Intel's EISA chip set and an Award BIOS. Caching duties are performed by 64K of 25-nanosecond processor RAM cache (expandable to 256K) running alongside the computer's 70-ns. system RAM. With 16 SIMM slots on the motherboard, you can bump this tower up to 64MB using 4MB SIMMs. Two of the eight available slots on the board are 16-bit ISA-bus slots; the remaining six are 32-bit EISA slots.

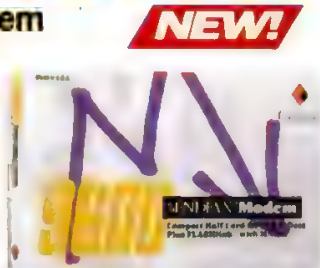
ACMA puts the ISA slots to good use with an Orchid ProDesigner II video board and a parallel/serial I/O board, leaving the EISA architecture open to handle the bus-mastering caching disk controller and any other EISA accoutrements you might care to add, with one exception: The ESDI controller has no provision for floppy disk drive management. That chore falls to a separate disk controller, leaving you only four available EISA slots.

If you intend to use the 486/33 EISA as a network server, the disk controller's cache level can be expanded to 4MB, and that maximum is heartily recommended to assist the Maxtor drive. On its own the drive is by no means slow, but with sev-

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★ M-800 Hand Scanner

(Marstek) Introducing the first hand scanner to deliver a resolution of 800 dpi and it's compatible with Microsoft Windows 3.0! Allows scanning capabilities of up to 640,000 dpi. Choose from 800 to 100 dpi and scan almost any image or text. Provides 64 gray levels, a special inverse function mode, 4.13 scanning width and more. **IN2000 \$199.**



★ Intermission

(Icom Simulations) This window screen saver and password protection system saves your monitor by automatically displaying one of thirty animated screen saver modules. Protects your confidential work with password protection so only you can return to your screen—and even protects your system from a reboot. Includes Curtain Call—the windows wallpaper changer. **GR1854 \$32.**



★ QEMM 386 5.1

(Quarterdeck Office Systems) Say goodbye to memory expansion problems when you install Quarterdeck Expanded Memory Manager 386 (QEMM 386). This award winning utility cleverly manages both extended and expanded memory in 80386, 80386SX and i486 computers, freeing up to an additional 226K for your programs to run in. QEMM 5.1 now supports Microsoft Windows 3.0! **EX1103/5 \$59.**



★ Computerized Classic Accounting

(Absolute Solutions) Now, for the first time, a general ledger, accounts receivable, accounts payable, inventory control program that looks like manual books yet offers all the advantages of computerization. Accounting the way you've learned it, utilizing the ease of Microsoft Windows 3.0 graphic interface and the power of the Microsoft Excel spreadsheet. **FN0284 \$265.**



★ CorelDRAW! 2.0

(Corel Systems) CorelDRAW! is the award winning PC graphics software that gives you incredible type control and superb drawing power in a value-packed program. Now, CorelDRAW! 2.0 comes with more drawing power, over 150 fonts; over 3500 clipart images and symbols; 31 import/export filters; an autotrace utility, a font conversion program and Mosaic, a visual file manager. **GR0543/5 \$369.**



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Power Backups

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Targus

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AC0570/80	Leather Laptop Case	139.
AC0590/600	Nylon Laptop Case	54.
AC3360	Nylon Midsize Laptop Case	New.

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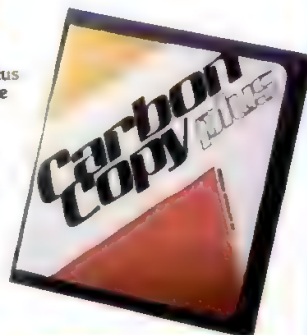
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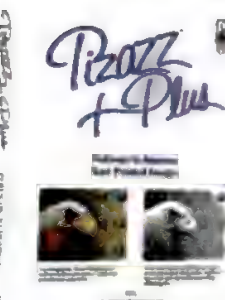


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GR1564 ★ New Printshop 35

Caere Corporation

GR1984 ★ Omnipage 386 3.0 489.

Computer Associates Int'l

GR1823/5 ★ CA Cricket Graph 1.2 139

Corel Systems

GR0543/5 ★ CorelDRAW! 2.0 369

Custom Applications

GR1943/5 ★ Freedom of Press Light 2.5 59.

hDC Computer Corp.

BS3114 ★ Icon Designer 35

Icom Simulations

GR1854 Intermission 32.

Micrografx

GR1293/5 ★ Designer 3.01 469

Microsoft

GR1773/5 ★ Charisma 344

New Visions Technology

GR0823/5 ★ Presentation Task Force 134.

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GR0884 Express Publisher 2.0 89

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GR0083/5 Harvard Graphics 2.3 319.

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GR0554 Publish-It! 1.2 129.

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GR0634 PC Paintbrush IV Plus 109

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CA0124 ★ Draft Windows CAD 3.0 445

Generic Software

CA0075 Generic CADD 5.0 235.

MathSoft

CA0114 MathCAD 2.5 305.

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UT1684 ★ Becker Tools 48.

Absolute Solutions

FN0284 ★ Computerized Classic Acct. 265

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BS0204 Pizazz Plus 67.

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BS2754 ★ Planisoft 2.5 139

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Chronologic Corp.

UT0584 Instant Recall 64.

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BS2184 Who What When 2.0 179.

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CM0074 CompuServe Membership Kit 21.

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Delrina Technology

BS0853/5 PerFORM Designer & Filler 2.1 99.

BS2604 ★ PerFORM PRO 279.

Delta Technology

UT0724 Direct Access 5.0 65

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CM0173/5 pcAnywhere IV 109.

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BS3033/5 Form Type 159

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Expansz (InfoChip Systems) Plug the expansz card into any open slot on your PC and your hard disk will behave as if it had up to three times its present capacity. Expansz also works with floppy disks. Requires DOS 3.x. **EX1330 \$135.**



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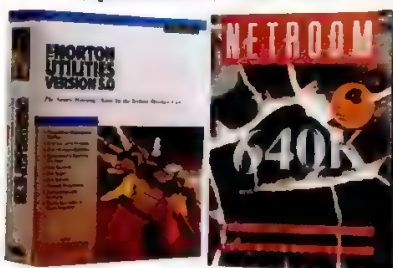
BS1803/5	Enable BP	119/129.
FastTrax International		
IN1110	FastTrax	49.
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UT0124	Fastback Plus 2.10	115.
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FN0215	One-Write Plus Acct. System	170.
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UT1634	★ FirstApps	49.
UT0644	★ Windows Express	55.
Helix		
BS3154	★ NetRoom Single User	49.
BS3134	★ NetRoom 4 User	91.
Hewlett Packard		
BS2783/5	★ New Wave 3.0	160.
Hilgraeve		
CM0064	Hyper Access/5 1.1	125.
Icom Simulations		
GR1854	★ Intermission	35.
Informix		
BS2283/5	★ Wingz for DOS/OS/2	329.
Inner Media, Inc.		
UT1754	★ Wide Angle	85.
Inset Systems		
UT1614	HiJaak 2.0	99.
Intuit		
FN0164	Quicken 4.0	37.
Iris Associates		
BS0914	★ 3 for 3	84.
Jacoby & Myers Law Offices		
BS2923/5	WillPower	35.
Lifetree		
BS3104	Correct Grammar 3.0	59.
Lotus		
BS3174	Agenda 2.0	288.
GR0864	Ami Pro 1.2	305.
BS1473/5	Lotus 1-2-3 Rel. 2.2	339.
BS2433/5	★ Lotus 1-2-3 Rel. 3.1	415.
BS2323/5	Symphony 2.2	519.
Meca		
FN0243/5	Managing Your Money 7.0	125.
Merril & Bryan		
UT1654	★ Turbo EMS 6.0	56.

NBI, Inc.		
WP0554	★ Legacy	298.
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UT1044	★ Your Way	116.
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CM0264	Prodigy Startup Kit	29.
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UT1914	★ Print Q 5.0	85.
UT0084	PrintQ LAN	259.
Software Products International		
BS2863/5	★ Access SQL	949.
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Spinnaker Software		
BS1923/5	BetterWorking Eight-In-One	37.
BS1134	The Resume Kit	29.
Symantec		
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UT0054	Norton Util. Advanced 5.0	109.
UT1604	The Norton Backup 1.2	95.
BS2113/5	Timeline 4.0	472.
Symantec/Helix		
BN0024	Norton Util. w/ Netroom Bundle	134.
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UT1054	Outside In	62.
ThreadZ Software Design Group Inc.		
UT1804	★ ThreadZ File F/X	75.
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BS0133/5	Timeslips III 4.0	189.
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UT0734	Check It! 2.1	85.
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WP0483/5	Definitions Plus	69.
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WP0453/5	WordStar Legacy	269.
XTree Company		
UT0694	XTree Pro Gold 2.0	79.

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TX0185	Turbo Tax Pro Series	219.
DacEasy Inc.		
TX0063	Sylvia Porter's Rapid Tax	42.
MECA		
TX0025	TaxCut '90	49.
Simon & Schuster		
TX0135	J.K. Lasser Tax Advantage 1990	25.
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TX0014	★ MacInTax for Windows	59.

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Borland International		
LN0023/5	Turbo C++	135.
LN0153/5	Turbo C Prof. ++	199.
Microsoft		
LN0074	C Compiler 6.0	315.
LN0043/5	QuickC 2.5	69.
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LN1444	Clipper 5.0	519.
Solution Systems		
LN0433/5	Brief 3.0 for DOS	169.
Spinnaker Software		
LN1464	★ Spinnaker Plus	285.

COMPUTERS

EISA 486/33s



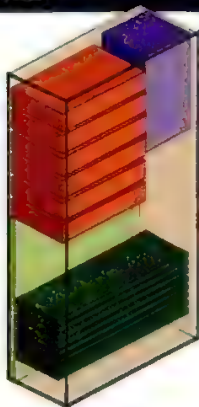
FACT FILE

ACMA 486/33 EISA

ACMA Computers Inc., 117 Fourier Ave., Fremont, CA 94539; 800-456-1818, 415-623-1212.

List Price: With 4MB RAM, 1.2MB or 1.44MB floppy disk drive, DOS 3.3 or 4.01, \$3,995; with 8MB RAM, 360MB hard disk, 1MB Super VGA video adapter and NEC MultiSync 3D monitor, \$7,995.

In Short: A healthy service policy and a reduced price, coupled with system components nearly identical to other machines in this group, make the ACMA an obvious choice for either standalone or network use.



CIRCLE 420 ON READER SERVICE CARD

eral users making data requests, the more disk cache you have, the better. This package's performance establishes it as the equal of any of the EISA computers reviewed in this issue.

ACMA's protection plan for this system is slightly different from most. The computer's parts are covered for one year against failure, but the labor warranty extends for an additional year. That may seem strange, but diagnostics and the labor involved in component replacement will often far exceed the cost of the replaced part. The plan is carried out through phone service with parts shipping and is backed by on-site service from TRW.

With the ACMA 486/33 EISA selling at between \$1,000 and \$1,500 less than some other machines, it's hard not to be suspicious. But the components are identical, and ACMA's excellent service package makes this computer a very interesting choice.

ADVANCED LOGIC RESEARCH INC.

ALR

PowerCache 33/4e

by Bruce Brown

If you want to go all out with a high-powered, high-capacity 33-MHz 486 EISA file server, the ALR PowerCache 33/4e is a powerful contender. ALR's entry in this category takes lots of

RAM—up to 128MB of it—and the machine is backed by the company's long-term reputation for building speedy high-end systems.

Naturally, the PowerCache 33/4e doesn't come cheap, though you should be able to find discounts from the authorized dealers who sell ALR's systems. In our standard configuration, it lists for \$15,562, including 8MB RAM, a swift Seagate 330MB hard disk with a sub-16-millisecond rating, an UltraStor U22C EISA controller filled to the max with 4MB of disk cache memory, and a Super VGA color display subsystem.



ALR PowerCache 33/4e, \$15,562.

The PowerCache 33/4e's rugged tower case includes an unusually powerful 300-watt power supply that has but three storage-device power connectors, requiring power-line splitters if you use more than three drives. Your dealer can rectify this minor inconvenience if you buy a machine configured with extra drives.

ALR's own motherboard uses a Phoenix ROM BIOS with ALR's memory management circuitry, which provides a unique 64-bit data path for both user RAM and a 128K 25-nanosecond RAM cache memory. The system comes with a minimum of 8MB RAM, and if your needs require, you can put up to 128MB on its proprietary memory board. All memory is plugged into this card, which, rather than plugging into a conventional slot, is more like a daughterboard that sits parallel to the motherboard. The memory board has



FACT FILE

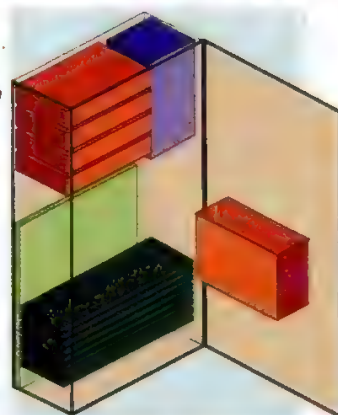
ALR PowerCache 33/4e

Advanced Logic Research Inc., 9401 Jeronimo, Irvine, CA 92718; 714-581-6770.

List Price: With 8MB RAM, 128K processor RAM cache, 1.2MB

floppy disk drive, Super VGA color display subsystem, one parallel and two serial ports, modem port, \$11,198; with 330MB hard disk, DOS 4.01, \$15,562.

In Short: This ALR model has room for a whopping 128MB of memory and makes an appropriate file server for a medium-to-large CAD system. You can buy cheaper computers than the ALR PowerCache 33/4e, but you probably won't find a better design.



CIRCLE 420 ON READER SERVICE CARD

a total of 32 SIMM sockets, which can take 256K, 1MB, or 4MB SIMMs rated at 80 ns. Our system used 1MB SIMMs.

The benchmark test scores bear out the overall performance promise of the PowerCache 33/4e, although it's not quite the fastest on any tests. Its processor scores are among the fastest within the test group, and its disk scores are also above average. Conventional Memory scores are a little slower than average, and the scores for the Super VGA video subsystem, while respectable, fall short of the very fast times on many of the other computers in this review.

Four half-height bays are stacked at the top front of the system, and a full-height device bracket sits on a sturdy cross support that can swing out when the computer case's exterior panel is removed. This means fewer drive expansion options than on most other machines in this roundup.

ALR is no newcomer to high-powered systems, manufacturing and selling ISA, MCA, and EISA systems in both desktop and tower cases. If you need to go the full route to the 33-MHz 486 EISA machine, you'll pay a \$2,000 list price premium over a similarly equipped 25-MHz 486 EISA tower machine. Be prepared to justify the expense of the extra speed. If you don't need the 486's internal cache or math coprocessor, you can buy an EISA 33-MHz 386 tower system for about



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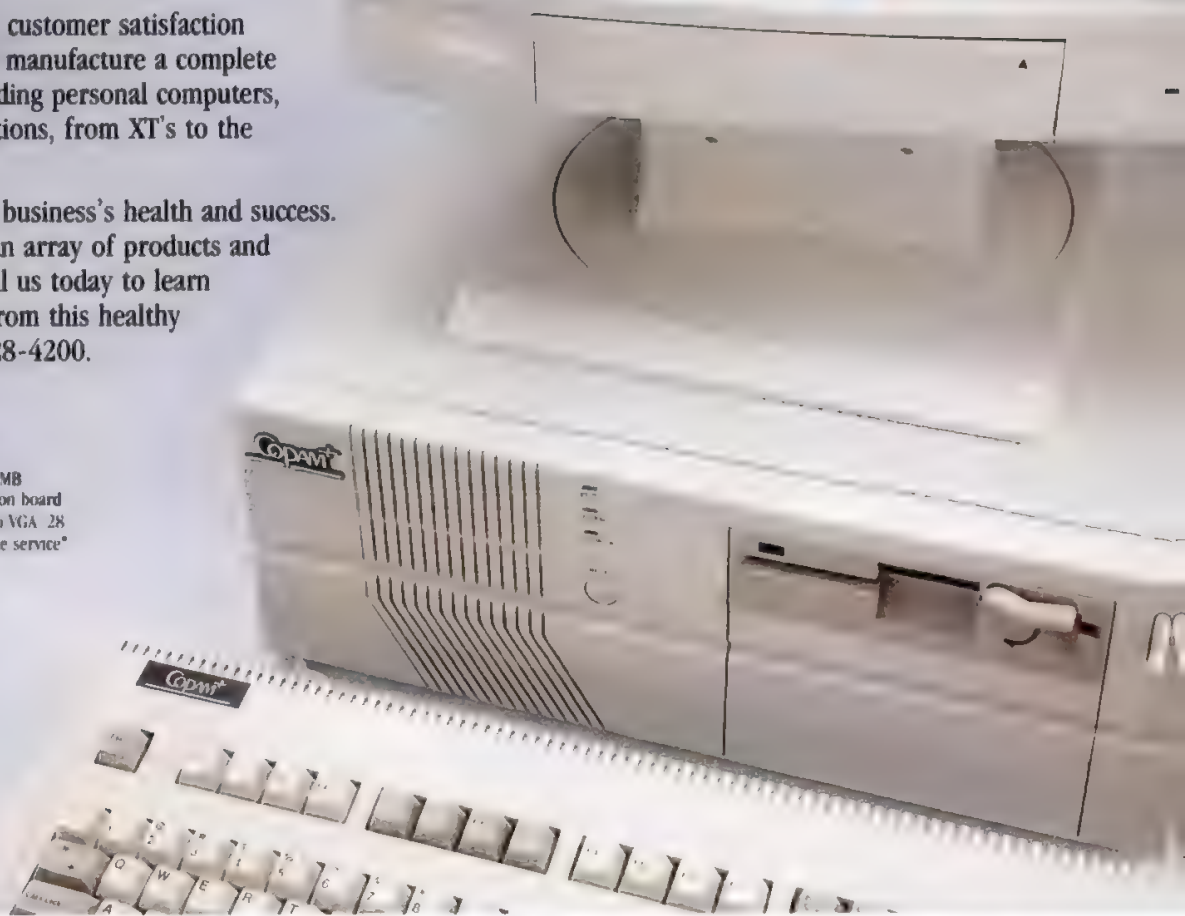
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\$4,000 less than the 486 version.

ALR sells computers through dealers only and includes a standard one-year warranty. Warranty service is available through dealers, authorized depots, and Intel service centers. An optional Intel on-site service contract is also available.

The ALR PowerCache 33/4e's massive memory expandability and somewhat limited drive bay options make this system a slightly better choice as a high-powered CAD workstation than as a giant file server. ALR's reputation as a supplier of quality high-end PCs adds to the computer's appeal.

AMAX ENGINEERING CORP.

Amax 486/33e

by Bill O'Brien

Amax Engineering Corp.'s 486/33e EISA computer falls in line with the 486 EISA crowd at \$9,300 for a computer with 8MB of RAM, a 346MB hard disk, and Super VGA display capability. You can even squeak by with 4MB RAM, no hard disk, and VGA color display for a list price of \$6,550. But the list price does not necessarily reflect what you would pay for the machine. Amax sells through dealers and VARs, and the suggested list price can come down significantly.

The tower enclosure certainly lives up to Amax's "No Surprises!" slogan. It is standard fare, with six half-height drive bays and a 250-watt power supply. Inside is a Free Technology motherboard containing 8MB of 70-nanosecond SIMMs and 64K of processor RAM cache, expandable to 256K. Not surprisingly, the Amax's performance on PC Magazine Labs' processor and memory benchmark tests shows the system falling right in line with the other machines in this roundup.

As with other Free Technology boards, two of the eight available slots are 16-bit ISA-bus slots; the remaining six are 32-bit EISA slots. Amax takes advantage of the ISA slots with an Orchid ProDesigner II video board and a parallel/serial I/O board. The Maxtor ESDI hard disk is controlled by an UltraStor caching EISA disk controller with 512K of RAM installed, expandable to 4MB. This setup requires a separate floppy disk controller, and Amax has risen to the occasion in an unexpected way. Rather than installing just a floppy controller card, Amax uses



Amax 486/33e, \$9,300.

one that also contains an IDE hard disk host adapter. You can use it with either a floppy disk drive or an IDE hard disk, but not both. Still, the extra versatility is welcome since you need to fill two slots with drive controllers.

Perhaps Amax should abandon its "No Surprises!" slogan after all, because its documentation is also a surprise—and a pleasant one at that. It is rare to find end-user documentation that is both readable and useful, with equal weight placed on

the sections for "Getting Started" and "Understanding the System" and on the technical specifications.

If you want an Amax computer, you'll need to contact Amax for a list of dealers, much as you would contact IBM. Similarly, all service is handled by the dealer; expect a one-year warranty. You won't find an IBM logo on an Amax computer, but you will find a quality system that will meet all of your expectations for an EISA machine.

BUS COMPUTER SYSTEMS INC.

Bus 486/33 EISA

by Bruce Brown

Bus Computer Systems' \$6,849 desktop 33-MHz 486 EISA computer is a standard machine with fine components that performs reasonably well. The Bus 486/33 EISA's list price does include on-site service from GE, but the machine is not one of the best values in this roundup.

The list price for the Bus 486/33 includes 8MB RAM, 1.2MB and 1.44MB floppy disk drives, a 15-millisecond 300MB NEC hard disk, and a DTC ESDI controller with 1MB of cache, and a Super VGA video subsystem. The system we tested substitutes a 155MB hard disk and incorporates the Orchid ProDesigner II 1,024-by-768 video adapter plus a NEC MultiSync 3D 14-inch monitor, boosting the price to \$8,249.

The Bus 486/33's processor and memory scores on our benchmark tests are average or better, and the video times are among the fastest in this review group. But the disk test scores place the computer in the middle of the group. These scores would normally indicate a very fast drive, but now the Bus 486/33 is competing with other machines with very large, fast hard disks paired with a variety of cached controllers.

Bus uses a Micronics motherboard with Phoenix ROM BIOS. The motherboard uses an Intel 82385 RAM cache controller and comes with 64K of 15-nanosecond RAM cache. The minimum memory in this system is 4MB using 1MB 70-ns. SIMMs. All of the SIMMs plug into sockets on the motherboard. If you utilize all 16 sockets and 4MB SIMMs, you can expand the system to a 64MB maximum.

The Bus 486/33's desktop case comes with a 200-watt power supply with four device connectors and space for five half-

FACT FILE

Amax 486/33e
Amax Engineering Corp., 4735 Mission Falls Ct., Fremont, CA 94539; 415-651-8886.

List Price: With 4MB RAM, 64K processor RAM cache, 1.2MB and 1.44MB floppy disk drives, VGA color display subsystem, DOS 4.01,

Microsoft Windows 3.0, \$6,550; with 8MB RAM, 346MB hard disk, VGA color adapter, Super VGA color monitor, \$9,300.

In Short: Amax produces a competitive machine with all the frills you could want. In this \$9,000-plus environment the company loses points for its restrictive service policy, but that is the equipment's only drawback.

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- 7568 □ FaceLift 1.0 for Windows 2.x/3.0 . 59.
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- 7569 □ Companion Value Pack 1.0 125.
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- Typeface Packages each 89.

Bloc Publishing ... NCP

- 1447 □ FormTool Gold 3.0 55.
- 9039 □ 3-D CHARTS To Go! 1.0 59.

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- 7357 □ Turbo C++ 1.0 Professional. . . 209.
- 6242 □ Quattro Pro 2.0 339.
- 1514 □ Paradox 3.5 529.

Broderbund ... NCP

- 1416 □ New Print Shop Companion . . . 33.
- 1434 □ New Print Shop 39.

Brown-Wagh ... NCP

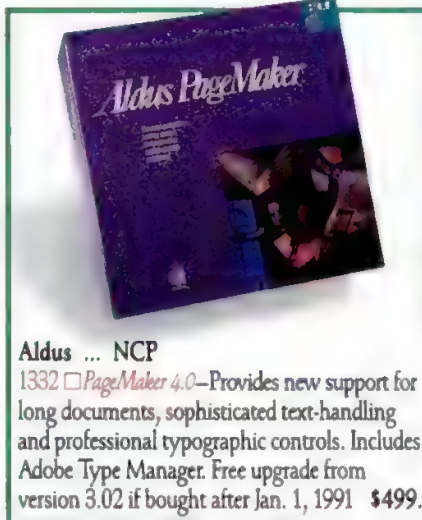
- 8579 □ MicroLogic More Fonts 2.0 75.

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- State Packages each 34.
- 6221 □ TurboTax 8.01 & Quicken Bundle . 65.

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- 8849 □ Instant Recall 1.2 64.

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- 7546 □ DOS Membership Kit 1.2 23.

Concentric Data Systems ... NCP

- 6575 □ R & R Relational Report Writer 4.0 159.

Corel Systems ... NCP

- 5506 □ CorelDRAW! 2.0 389.

Custom Applications ... NCP

- 8232 □ Freedom of Press Light 2.5 59.

Data Storm ... NCP

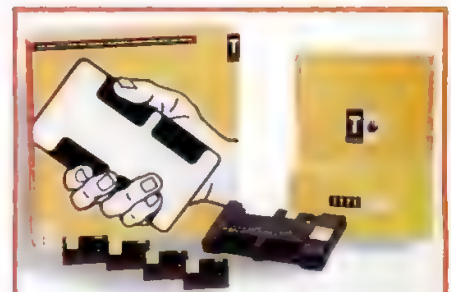
- 4798 □ PROCOMM PLUS 2.0 69.

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- 5611 □ Crosstalk for Windows 1.1 125.

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- 4325 □ PerFORM 2.1 95.

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- 8288 □ DR DOS 5.0 145.

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- 8378 □ PC Anywhere IV 4.02 105.

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- 8103 □ Pyro 1.0 35.

- 7725 □ Direct Access 5.0 65.

- 3950 □ Fastback Plus 2.1 119.

FormWorx ... NCP

- 5810 □ FormWorx with Fill & File 2.5 . . . 85.

- 7311 □ Form Publisher for Windows 1.2. 139.

Fox Software ... NCP

- 6188 □ FoxPro 1.02 459.

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- 7071 □ Language Master 3.0 49.

- 7416 □ Language Master 3.0 for Windows 49.

Funk Software ... NCP

- 7380 □ P.D. Queue 1.0 (print spooler) . . . 59.

- 2228 □ Sideways 3.3 59.

Geoworks ... NCP

- 8789 □ Ensemble 1.0 129.

Great American Software ... NCP

- 4880 □ One Write Plus Acct. Sys. 2.06 . . 189.

Hayes ... NCP

- 7983 □ Smartcom Exec 2.0 79.



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 2323 □ **HyperACCESS/5 2.0 (DOS & OS/2)** 115.
IBM ... NCP
 6599 □ **Current 1.1** 239.
Individual Software ... NCP
 6222 □ **Resume Maker 1.3** 29.
Inner Media, Inc. ... NCP
 8846 □ **Wide Angle 1.0** 69.
Inset Systems ... NCP
 7298 □ **Hijaak 2.0** 99.
 7300 □ **Inset Plus Hijaak** 125.
Insight Development ... NCP
 8320 □ **PrinTools 1.0** 85.
Insight Resource ... NCP
 8851 □ **KO-Pilot for WordPerfect 5.1** 55.
Intuit ... NCP
 2426 □ **Quicken 4.0** 39.



Insight Development ... NCP
 8320 □ **PrinTools 1.0**—Utilities for the HP LaserJet, DeskJet & compatibles. Includes Spooler, Screen Dump, Screen Capture, SetUp, Plot with HPGl/2 support, and Help utilities \$85.

- Isogon ... NCP**
 7478 □ **FontSpace 2.0** \$59.
LaserGo ... NCP
 7635 □ **Go Script Plus 3.0** 189.
LaserTools ... NCP
 6882 □ **PrintCache 2.3** 99.
Lord Publishing ... NCP
 5191 □ **Ronstadt's Financials 1.02** 75.
Lotus ... NCP
 5417 □ **1-2-3 3.1** 429.
 5653 □ **1-2-3 2.2** 349.
 5134 □ **Magellan 2.0** 109.
MECA ... NCP
 4603 □ **Andrew Tobias' Tax Cut-1990 Taxes** 49.
 8884 □ **MYM & Tax Cut (white supplies last)** 129.
Micro Logic ... NCP
 6787 □ **Info Select 1.1** 55.
Microcom ... NCP
 7649 □ **Virex-PC 1.1** 79.
 6234 □ **CarbonCopy Plus 5.2** 119.
Microlytics ... NCP
 8797 □ **Inside Information 1.0** 68.
 7931 □ **Random House Encyclopedia** 68.



Inset Systems ... NCP
 7298 □ **Hijaak 2.0**—Capture screens & convert graphics files with Hijaak release 2.0. New features include 5K pop-up window, many new raster & vector formats and support for more than 16 Group 3 fax devices. \$99.

- Microsoft ... NCP**
 2894 □ **QuickBasic 4.5** 69.
 7010 □ **Windows 3.0** 99.
 7388 □ **Project 1.0 for Windows** 459.
 7882 □ **Productivity Pack 1.0 for Windows** 45.
 2904 □ **Works 2.0** 99.
 2901 □ **Word 5.0** 209.
 7387 □ **PowerPoint 2.0 for Windows** 329.
 6195 □ **Word 1.1 for Windows** 329.
 2856 □ **Excel 3.0 for Windows** 329.
 8137 □ **Office for Windows (includes Excel, Word for Windows, and PowerPoint)** 659.
 2853 □ **C Compiler 6.0** 329.

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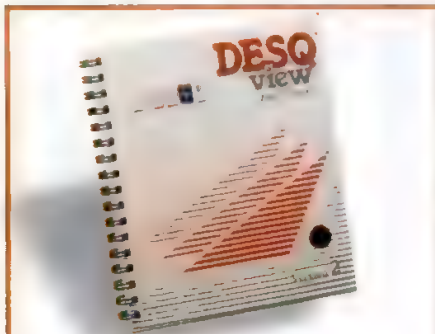


Bitstream ... NCP
 Fast and easy to use, FaceLift scales printer fonts to any size. Includes 13 typefaces to give you professional documents instantly.
 7568 □ **FaceLift 1.0 for Windows 2.0/3.0** \$59.
 8040 □ **FaceLift for WordPerfect 5.0/5.1** 59.

- Multisoft ... NCP**
 4925 □ **PC-Kwik Power Pak 2.0** 75.
Nolo Press ... NCP
 5122 □ **For The Record 2.0** 35.
 2982 □ **WillMaker 4.0** 39.
PC Globe ... NCP
 5902 □ **PC Globe 4.0** 39.
 5900 □ **PC USA 2.0** 39.
Personics ... NCP
 4384 □ **Ultravision 2.0** 79.
 7048 □ **Monarch 1.0 (Data Mgmt. Tool)** . 319.
PowerUp ... NCP
 7860 □ **Calendar Creator Plus 4.0** 45.
 7861 □ **Address Book Plus 3.0** 49.
 7858 □ **Express Publisher 2.0** 89.
Precision Software ... NCP
 6600 □ **Superbase 4 for Windows 1.2** . 429.
Qualitas ... NCP
 7539 □ **386MAX 5.1** 75.
 7967 □ **BlueMAX 5.1 for PS/2 (3 1/2" only)** . 85.
Quarterdeck ... NCP
 6422 □ **QRAM 1.0** 54.
 3221 □ **Expanded Memory Mgr. 386 5.1** . 65.
 3220 □ **DESQView 2.3** 85.
 4586 □ **DESQView 386 2.3** 145.
QUE Software ... NCP
 4155 □ **RightWriter 4.0** 54.
Reality Technologies ... NCP
 7891 □ **WealthStarter 1.0** 39.
 6572 □ **WealthBuilder 1.1** 145.
Reference Software ... NCP
 4396 □ **Grammatik IV 1.0** 59.
 7483 □ **Grammatik for Windows 1.0** 59.
Revolution Software ... NCP
 4480 □ **VGA Dimmer 3.0 (screen saver)** . 29.
Roykore ... NCP
 8162 □ **ABC Flowchart 1.1** 189.
Samna ... NCP
 5799 □ **Ami Pro 1.2** 309.
Sitta ... NCP
 6675 □ **TOPS Network Bundle 3.0** 159.
 3720 □ **Flashcard 2.1 (AppleTalk network card)** 155.
Softlogic Solutions ... NCP
 3542 □ **Software Carousel 5.0** 55.

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Quarterdeck ... NCP
3220 □ **DESQview 2.3**—Load multiple applications and easily switch between them without exiting and reloading. An easy way to window your current standard DOS applications. \$85.

- Software Publishing ... NCP**
3496 □ Professional Write 2.2 169.
3482 □ Harvard Graphics 2.3 329.
Solution Systems ... NCP
7977 □ Brief 3.0 (Programmer's Editor) . 189.
Spinnaker ... NCP
3478 □ PFS:First Choice 3.1 105.
7604 □ **PLUS for Windows 1.0** 289.
Symantec ... NCP
6397 □ The Norton Backup 1.2 105.
3146 □ The Norton Utilities 5.0 119.
3425 □ Q&A 3.0 239.
7999 □ Norton Anti-Virus 1.0 89.
Systems Compatibility ... NCP
8215 □ Outsideln 1.0 65.
6564 □ Software Bridge 4.1 79.
TIMESLIPS ... NCP
2987 □ Timeslips III 4.0 195.
6994 □ PercentEdge 1.0 69.
Timeworks ... NCP
6253 □ Publish-It! 1.1 139.
Touchstone Software ... NCP
7420 □ Check It 3.0 89.
Travelling Software ... NCP
5179 □ LapLink III 3.0 95.
Ventura Software (Xerox) ... NCP
7796 □ Ventura Publisher for Windows 3.0 569.

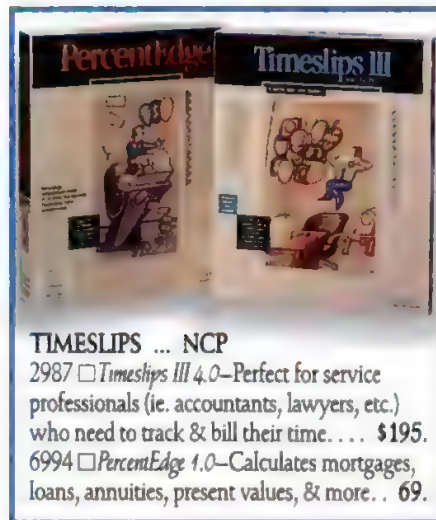


Reality Technologies ... NCP
7891 □ **WealthStarter 1.0**—Tired of living paycheck to paycheck? Use WealthStarter to create a budgeting, savings and investing system that really makes the most of the money you make \$39.

- West Lake Data Corp. ... NCP**
7577 □ PC-FullBak+ 2.0 \$52.
WordPerfect Corp. ... NCP
7781 □ LetterPerfect 1.0 129.
3804 □ WordPerfect 5.1 265.
6685 □ DrawPerfect 1.1 279.
WordStar International ... NCP
6791 □ WordStar Prof. 6.0 279.
XTREE ... NCP
6161 □ XTree Gold 2.0 95.

RECREATIONAL/EDUCATIONAL

- Accolade ... CP**
8081 □ Jack Nicklaus' Unlimited Golf ... 39.
Broderbund ... CP
8068 □ Where in the World is Carmen Sandiego Deluxe Edition 52.
5851 □ SimCity 33.
8886 □ SimEarth 45.
Electronic Arts ... NCP
4534 □ Mavis Beacon Teaches Typing (CP) 35.
7865 □ PGA Golf 39.
Harvard Associates ... NCP
2324 □ PC Logo 3.0 59.



TIMESLIPS ... NCP
2987 □ **Timeslips III 4.0**—Perfect for service professionals (ie. accountants, lawyers, etc.) who need to track & bill their time. \$195.
6994 □ **PercentEdge 1.0**—Calculates mortgages, loans, annuities, present values, & more. . 69.

- Microsoft ... NCP**
7881 □ Entertainment Pk for Windows 1.0 29.
2858 □ Flight Simulator 4.0 42.
8270 □ Aircraft and Scenery Designer 1.0 29.
Microsoft Press (Books)
8126 Running with DOS 4th Edition. 20.
8129 Running Windows (2nd Edition) ... 22.
8136 Running Microsoft Excel 22.
Penton Overseas ... NCP
□ VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese). each 35.
Sierra ... CP
8146 □ Quest for Glory II 39.
7972 □ King's Quest V (VGA) 45.
SirTech. ... CP
8235 □ Bane of the Cosmic Forge 39.
Spectrum Holobyte ... NCP
5993 □ Welltris 27.
Software Toolworks ... NCP
4659 □ Chessmaster 2100 (CP) 35.
7372 □ World Atlas 42.
Stone & Assoc. ... NCP
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3435 □ Letters, Numbers, Words 2.2 22.



Microsoft ... NCP
2856 □ **Excel 3.0 for Windows**—Now the best Windows spreadsheet just got better! New features make it even more powerful and easier to use than ever. \$329.

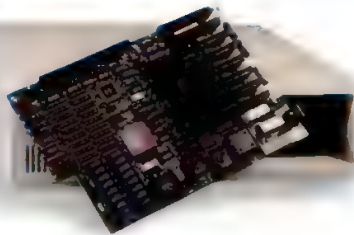
- Toyogo ... NCP**
7676 □ Nemesis Go Master Deluxe 88.
True BASIC, Inc. ... NCP
□ Kemeny/Kurtz Math Series. each 45.

HARDWARE

Warranties listed next to manufacturer.

- American Power ... 2 years**
7108 Smart UPS 400 339.
7105 Smart UPS 600LS 469.
6811 360SX (stand-by power source) ... 219.
7106 520ES (stand-by power source) ... 329.
AST Research ... 5 years
1299 SixPakPlus 384k C/S/P 179.
8041 SixPak 286 0k 99.
Boca Research ... 5 years
7001 BOCARAM/AT PLUS (0-8 Meg) ... 119.
7061 BOCARAM/XT 0K (0-2 Meg, LIM 4.0) 99.
6998 I/O Board for AT 59.
6999 I/O Board for Microchannel (S/S/P) 109.
8380 BasicVGA (256K, 640 x 480) 69.
8381 SuperVGA (1 Meg, 1024 x 768) ... 145.
Bravo Communications ... 2 years
7400 2 Pos. Laser Compatible Switch Box 109.
Brown-Wagh ... 1 year
8578 Creative Labs Sound Blaster 159.
Canon ... 1 year
7894 BJ-10e Printer w/free case (4.6 lb.) 349.
9037 BJ-300 Printer (80 column) 549.
9038 BJ-330 Printer (136 column) 649.
7897 BubbleJet Ink Cartridge 23.
CH Products ... 1 year
8119 FlightStick w/Falcon & GameCard III 79.
7345 RollerMouse (Trackball) serial 85. bus 99.
Curtis ... lifetime
1708 Ruby-Plus SPF-2 Plus 65.
7358 Command Center 89.
Glass Filter Plus (specify size) each 65.
Datadesk ... 3 years
6901 Switchboard 175.
Epson ... 2 years
We are an authorized Epson Service Center.
1906 FX-850 (80 col., 264 cps, 9 pin) ... call
1904 FX-1050 (136 col., 264 cps, 9 pin) .. call
5183 LQ-510 (80 col., 180 cps, 24 pin) .. call
1930 LQ-850 (80 col., 264 cps, 24 pin) .. call
1917 LQ-1050 (136 col., 264 cps, 24 pin) call
5184 LX-810 (80 col., 180 cps, 9 pin) ... 185.

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Hauppauge Computer Works ... 1 year
9032 20 MHz 386 Motherboard for XT—Need 386 power, performance, and compatibility? Easily upgrade your PC, XT, AT or true compatible with the Hauppauge Motherboard.
30 day Money Back Guarantee \$995.

Hauppauge Computer ... 1 year
9031 20 MHz 386 Motherboard for PC . 995.
9032 20 MHz 386 Motherboard for XT. . 995.
9033 20 MHz 386 Motherboard for AT. . 995.
9034 33 MHz 386 Motherboard for AT. 1595.

Hayes ... 2 years
2307 Smartmodem 2400. 349.
8049 JT Fax 9600B w/Smartmodem 2400 379.
7391 Ultra 9600 Modem 799.
9192 Ethermate 8 (ethernet card). 199.

Hewlett-Packard ... 1 year
7976 DeskJet 500 (with ink cartridge) . . 549.
6582 LaserJet IIP (with toner). 949.
6754 LaserJet III (with toner) 1699.

Intel ... 5 years
6421 2400B MNP Internal Modem . . . 199.
4696 2400B Internal Modem 149.
5119 2400 Baud External Modem . . . 179.
6420 2400EX MNP Modem. 229.
7880 9600EX Modem 549.

2346 Inboard 386/PC with 1 Meg . . . 495.
5336 Above Board Plus 8 2 Meg . . . 549.
5342 Above Board Plus 8 I/O 2 Meg . . 569.
7782 SatisFAXtion (fax board) . . . 399.
8778 SatisFAXtion for Microchannel . . 449.
8901 Matched Memory 2 Meg (PS/2) . . 189.
8903 Matched Memory 4 Meg (PS/2) . . 499.

MATH COPROCESSORS
7385 80287XL (16 MHz 80286 CPU's) . . 199.
4750 80387SX (16 MHz 80386SX CPU's) 309.
2371 80387 (16 MHz 80386 CPU's) . . . 349.
2372 80387-20 (20 MHz 80386 CPU's) . . 399.
4121 80387-25 (25 MHz 80386 CPU's) . . 499.

Kensington Microware ... 1 year
2582 Master Piece Plus 109.
7899 Expert Mouse serial 119. 7900 bus 129.

Key Tronic ... 3 years
4518 101 Plus Keyboard 99.

Kraft ... 5 years
5800 3 button Thunder Joystick. 29.
5813 Game Card/Thunderstick Bundle . . 55.
7862 TopTrak (Laptop Trackball). 75.

LaserGo ... 1 year
8534 1 Meg Upgrade for LJII/III. 139.

Logitech ... limited lifetime

7768 C9 Mouse with Windows. \$149.
6029 Trackman serial . 85. 6028 bus . 89.
4297 ScanMan Plus (hand scanner) . . . 165.
7975 ScanMan 256 319.
8694 MouseMan (serial) 69.

Micron Technology ... 2 years

7595 2 Meg Expansion for HP
LaserJet IIP or III. 159.
7012 Memory Upgrade PS/2 70 - 2 Meg 149.

Microsoft ... lifetime

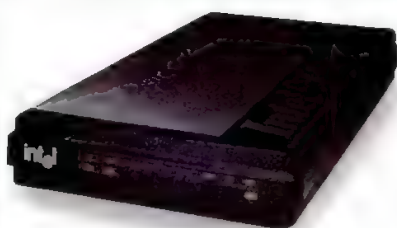
7597 Microsoft Mouse. 89.
2897 Mouse with Paintbrush 105.
2898 Mouse with Windows 3.0 149.

MicroSpeed ... 1 year

PC-TRAC Trackball
6007 serial. 75. 6008 bus. 89.
7271 Inport. 79. 6330 PS/2. 79.

Mouse Systems ... lifetime

5997 Trackball (1 yr. warranty) serial 65. bus 69.
7878 PC Mouse III (bus or serial) 89.



Intel ... 5 years

7880 9600EX Modem—Provides ultra-fast data communications without sacrificing compatibility. Supports V.32 & V.42bis 9600 bps operation, as well as MNP Level/5 and Hayes compatible 2400/1200/300 bps modes. \$549.

NEC ... 2 years

4799 Multisync 2A (VGA Monitor) . . . 499.
5085 Multisync 3D Monitor 689.

Orchid Technologies ... 4 years

7863 ProDesigner VGA II with 1 Meg. . . 329.

PC Power & Cooling ... 1 year

REPLACEMENT POWER SUPPLIES
3203 Turbo Cool 200 149.
7915 Turbo Cool 300 165.
3200 Silencer 150 (84% noise reduction) 115.
7053 InnerSource 2210. 349.

Pacific Data Products ... lifetime

6779 25 Cartridges in One! (for LJ II, IIP, III) 275.
8816 PacificType (40 PostScript Typefaces for PacificPage PE 4.0 users). 275.

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MECA ... NCP

8884 Managing Your Money 7.0 with Tax Cut-1990 Bundle—Put Andrew Tobias to work for you with the award winning Managing Your Money and Tax Cut in a special bundle. Available while supplies last \$129.

8975 Complete Font Library (for LJIII) . . 275.
Memory upgrade for LaserJet IIP/III:

7055 2 Meg . . . 169. 7759 4 Meg . . . 279.
7158 PacificPage PE 4.0 (for LJ IIP/III) . . 379.

6834 PacificPage with free 2 Meg
Memory Board (for LaserJet II) . . . 379.

Practical Peripherals ... 5 years

3100 1200 Baud External Modem 75.
3103 2400 Baud Internal Modem 129.
3102 2400 Baud External Modem 179.
8993 2400 Baud Int. Modem (V.42 bis) . . 169.
8994 2400 Baud Ext. Modem (V.42 bis) . . 209.
4542 2400 Baud Internal Modem for PS/2 229.
8132 PM2400 Pocket Modem 109.
7934 PM9600SA Modem 489.

PSION .. 1 year

7086 MC600 Mobile Computer 2149.

Reflection Technology .. 1 year

7127 Private Eye (virtual display) 499.

SAFE Power Systems ... 2 years

6747 Safe 400S. 399.



Bloc Publishing ... NCP

9039 3-D CHARTS To Go! —A Windows 3.0 chartmaker that makes creating 3-D charts a breeze. Enter numbers directly or import from Lotus, Excel or Wingz. Add text, import graphics & change the angle, coloring or shadowing \$59.

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TheComplete PC ... 2 years

8082 TheComplete Half Page Scanner/400

w/ReadRight Personal OCR Software 289.

6797 TheComplete Fax Portable 319.

5828 TheComplete Communicator 449.

Tripp Lite ... 2 years

6199 Isoobar 4-6 (4 outlets, 6 ft. cord) 49.

6200 Isoobar 6-6 (6 outlets, 6 ft. cord) 59.

9193 BC350 (350W Battery Backup) 219.

6624 BC450 (450W Battery Backup) 269.

7889 BC1200 (1200W LAN Backup) 669.

6018 LC1200 (1200W Line Conditioner). 159.

Video 7 ... 7 years

5883 1024i VGA (includes 512k). 199.

4931 VRAM VGA 512k 369.

DRIVES

CD Technology ... 1 year

8057 Porta-Drive CD-ROM 649.

8105 Installation Kit for Standard Bus. . . . 95.

8106 Installation Kit for Microchannel . . . 249.



Practical Peripherals ... 5 years

7934 PM9600SA Modem—Practical Peripherals does it again by making communications affordable with their newest modem featuring the data compression & error correction of 9600bps V.32 & V.42bis operation. . . . \$489.

Conner Peripherals ... 1 year

8875 CP3044 40 Meg IDE HD (25 ms) . . . 325.

8874 CP3184 80 Meg IDE HD (25 ms) . . . 499.

8876 CP3104 100 Meg IDE HD (25 ms) . . . 549.

IOmega ... 1 year

5116 Bernoulli II 44 Meg Internal 995.

7551 Bernoulli II Transportable 44 Meg . . . 997.

5113 44 Meg Cartridge Tripak (5 1/4") . . . 269.

2500 PC2B Controller 209.

Mountain Computer ... 2 years

2917 40-60 Meg Internal Tape Drive 259.

5500 83-152M Int. Tape Drive 629.

5190 DC2000 Pre-formatted Cartridges ea. . 35.

6153 DC2120 Tape Cartridge (5 pack) . . . 149.

Pacific Rim ... 1 year

5010 1.2 Meg External (for PS/2's) 215.

6602 1.44 Meg External (for PC/XT/AT) . . 239.

Plus Development ... 2 years

6424 Hardcard II 80 Meg (19 ms) 599.

8304 Hardcard II XL 50 Meg (9 ms) 399.

8287 Hardcard II XL 105 Meg (9 ms) 689.

Seagate ... 1 year

2286 30 Meg Int. Hard Drive ST238R

(w/controller and cables, 65 ms) 269.

4554 40 Meg Int. HD ST251-1 (28 ms) . . . 269.

4624 80 Meg Int. HD 4096 (28 ms) 619.

TEAC ... 1 year

4670 1.44 Meg Drive for PC/XT (3 1/2") . . \$79.

4326 1.44 Meg Drive for AT (3 1/2") with

Bastech software 99.

4951 720k Drive for PC/XT (3 1/2") 69.

6951 1.2 Meg Drive for AT (5 1/4") 89.

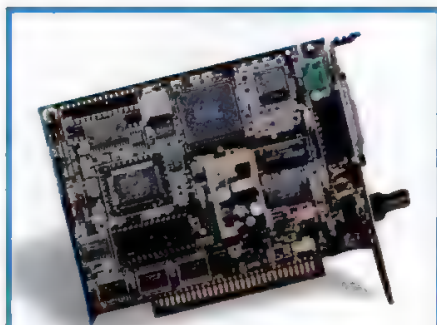
DISKS/MEDIA

Maxell ... lifetime

2789 5 1/4" MD2-D 360k Disks (Qty. 10) . . . 10.

2792 3 1/2" DS/DD 720k Diskettes (Qty. 10) . 13.

2793 3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10) 21.



Hayes ... 2 years

9129 EtherMate 8—8-bit Ethernet adapter for IBM PC XT/AT, PS/2 Model 25+ 30, and compatibles. Supports Thick Ethernet DB-15 AUI and Thin Ethernet BNC connections \$199.



Canon ... 1 year

These ultra quiet BubbleJet printers offer dazzling print quality to rival lasers at dot-matrix style prices. Advanced paper handling capabilities.

9037 Bf-300 Printer (80 column) \$549.

9038 Bf-330 Printer (136 column) 649.

Sony ... lifetime

3291 5 1/4" DS/DD 360k Disks (Qty. 10) 9.

3297 3 1/2" DS/DD 720k Diskettes (Qty. 10) . . 12.

3298 3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10) 19.

6148 3 1/2" DS/DD (3 Pack) 29.

6375 3 1/2" DS/HD (3 Pack) 49.

8185 QD 2040 Tape Cartridge 19.

6712 QD 600A Tape Cartridge 27.

6715 QD 6150 Tape Cartridge 27.

3M ... lifetime

3943 DC 2000 Tape Cartridge 20.

6065 DC 2080 Tape Cartridge 25.

3944 DC 600 Tape Cartridge 29.

5679 DC 6150 Tape Cartridge 29.

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6556 256k DRAM (100 ns, set of 9) call

5510 1 Meg x 9 SIMMs (80 nanosecond) call

5746 1 Meg Chips (80 ns, set of 9) call

7813 256k x 4 Chips call

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Microcom ... NCP

7649 □ Virex-PC 1.1—Effective, comprehensive solution to DOS-based computer viruses \$79.

6234 □ CarbonCopy Plus 5.2—Allows you to access and control a remotely located PC. . 119.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

- Call 603/446-7721 for information.



PC Conservation.

Our favorite multiuser environment. (Or, the greening of Big Blue.)

It's only natural that you'd find some serious environmental awareness here in the pristine preserve of Marlow, NH (pop. 565). After all, we have some pretty nice environment to be aware of. In fact, 90% of Marlow is undeveloped forest and wetlands. And our headquarters are on the banks of the Ashuelot River, a popular white-water rafting stream. So we're making sure our act is as clean as it can be.

For example, we now recycle all our used four-color magazines and catalogs. They are beaten to a pulp and transformed into 100% recycled paper right here in New Hampshire.

We, in turn, use this very same paper as a packing material *instead of those annoying foam peanuts*. Overall, we've cut our waste by over 75% in just one year. And, inspired by our down-to-earth mascots, we continue looking for ways to do more (with less), and encourage our vendors to do the same.

The Four Rs: Reduce, Re-use, Recycle, Raccoon.

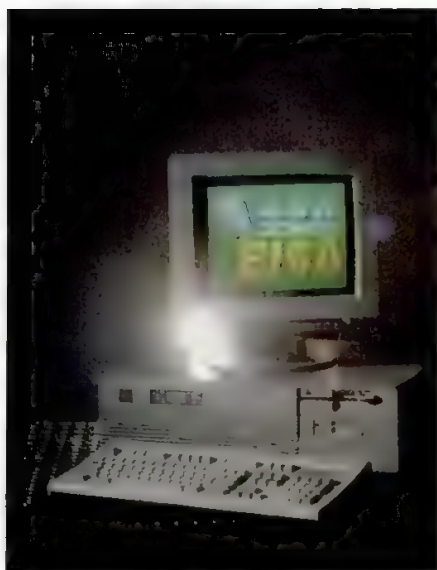
You'll find it easy to stow it, not throw it when carrying your very own PC Connection insulated lunch bag and re-usable string shopping bag. You won't ever want to leave home without them. They're both free when you place an order of \$750 or more between now and June 30.



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COMPUTERS
EISA 486/33s



Bus 486/33 EISA, \$8,249.

height drives; this is not really capacious, but probably sufficient for most users. In addition to the tested 155MB hard disk, Bus offers 330MB and 670MB ESDI drives with this system, for \$850 and \$1,700 upgrade premiums, respectively.

Bus sells a wide variety of ISA and EISA computers. The Bus 486/33 EISA costs \$700 more than a 25-MHz 486 EISA setup, and \$500 more than an identically equipped 33-MHz 486 ISA system. Since the price delta between these performance levels is fairly small, there's no reason to hesitate if you want EISA and you want the fastest Bus machine available.

Bus sells most systems via mail order



Bus 486/33 EISA

Bus Computer Systems Inc., 135 W. 26 St., New York, NY 10001; 800-451-5279, 212-627-4485.

List Price: With 8MB RAM, 64K processor RAM cache, 155MB hard disk, 1.2MB and 1.44MB floppy disk drives, Super VGA color display subsystem, one parallel and two serial ports, game port, DOS 4.01, \$5,999; with 300MB hard disk, \$6,849; with 155MB hard disk, cached EISA floppy/hard disk controller, 1MB 1,024-by-768 video adapter, \$8,249.

In Short: The Bus 486/33 EISA costs only \$500 more than a similarly equipped ISA PC from the same vendor. However, many vendors offer a similar package at a lower price.

CIRCLE 543 ON READER SERVICE CARD

and a small proportion through dealers. The one-year parts-and-labor warranty is backed by an on-site service contract with GE—an assurance of quality care if you should have any problems during the warranty period.

Although the Bus 486/33 EISA is a fine representative of this class of machine, you may want to look for comparable quality at a lower price.

C² MICRO SYSTEMS INC.
C² Saber 486 EISA

by Patrick Honan

The \$8,100 price for the C² Saber 486 EISA's standard configuration is reflective of most aspects of the system: good, but not good enough to put it head and shoulders above the competition.

The standard configuration includes 8MB of RAM, a 339MB ESDI Maxtor hard disk and a cached EISA controller, one floppy disk drive, and a Trident Microsystems video board with 1,024-by-768 maximum resolution. The only non-standard extra in our test unit was a second high-density floppy disk drive, which boosted the price \$95 to \$8,195.

Inside the 25.5- by 7.5- by 17.5-inch tower case is room for seven half-height storage devices. The unit we tested had a full-height hard disk and two half-height floppy disk drives installed, leaving room for three more half-height devices such as a CD-ROM reader or tape backup unit. While this is adequate for many users, those who want to perform functions like disk mirroring, which requires multiple hard disks, will probably want to opt for a unit with more storage bays.

The hard disk is coupled with Ultra-Stor's Ultra-22C 32-bit EISA controller. The one we received for review had 512K of cached memory on it, expandable to 4MB. The Ultra-22C is the only EISA peripheral C² offers, but you can add a third-party EISA peripheral to one of the Saber's six 32-bit EISA slots. There are also two 16-bit ISA slots. One of the 16-bit slots and three of the 32-bit slots were open on our tested unit, with the VGA board, I/O board, hard disk controller, and floppy controller taking up the remaining slots. Add a network interface board, modem, or tape drive controller board, for example, and you will quickly feel pinched



C² Saber 486 EISA, \$8,195.

by the shortage of free slots.

You can expand system RAM to a maximum of 64MB, all on the motherboard, by adding 4MB SIMMs. You can also install 256K or 1MB SIMMs. Our tested unit came with 80-nanosecond 1MB SIMMs. The standard processor RAM cache comprises 64K of 25-ns. SRAM, expandable to 128K or 256K.

The Saber 486 EISA fell in the middle of the pack among the reviewed units in processor, memory, and disk benchmark tests. The one area where it stumbled was in video performance, where it had the slowest time on both Video BIOS Routine benchmark tests and one of the slowest times on the Direct to Screen test.

The power supply is rated at 300 watts, which is more than most of the other units in our review provide. But there are only five device connectors on the power supply; you'll need to add a Y connector to install more than five storage devices.

The warranty provides the standard one-year coverage on parts and labor. A year of on-site service, provided by Nationwide Warranty Corp., is a bonus given the critical network role an EISA unit plays in many offices. In addition, C² maintains a technical support department, but the call is not toll-free.

C² offers a full line of ISA systems that range from a 12-MHz 286 to a 33-MHz 486 model. If you want the speed of the 486 processor but won't be using the unit as a file server or in other disk-intensive situations where EISA's bus-mastering abilities and 32-bit-wide data bus are important, C²'s 33-MHz ISA model would



FACT FILE

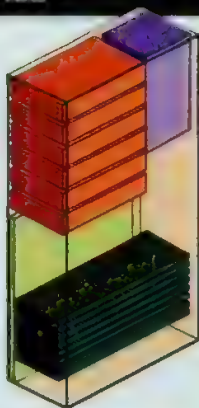
C² Saber 486 EISA

C² Micro Systems
Inc., 1205 Fulton
Pl., Fremont, CA
94539; 415-683-
1111

List Price: With
1MB RAM, 1.2MB
or 1.44MB floppy
disk drive, VGA
adapter,
monochrome
display, DOS 4.01,
\$4,995; with 8MB
RAM, 64K
processor RAM
cache, 339MB hard disk, 1.2MB floppy disk
drive, Super VGA color display subsystem,
\$8,100; with 1.2MB and 1.44MB floppy disk
drives, \$8,195.

In Short: In performance and expansion
capabilities, the C² Saber 486 EISA generally
fares neither better nor worse than the norm,
though its video scores are somewhat
disappointing. The price is slightly better than
average but still no bargain.

CIRCLE 544 ON READER SERVICE CARD



came with 12MB of RAM (which we downgraded to 8MB for testing), plus a 525MB tape backup, an additional 1.2MB floppy disk drive, an Advanced Graphics 1024 video board, OS/2 1.2, and a 2,400-bps modem, for a grand total of \$26,059. Keep in mind that Compaq computers are sold only through dealers, so you'll most likely get a significant discount.

The machine we tested actually started life as a 386/33L unit, but we upgraded it by replacing the processor board with a 33-MHz 80486 processor, a \$3,999 option. All that's required is swapping the board, putting on a new front logo panel, and running Compaq's self-configuring EISA setup software. The simple upgrade process takes about 15 minutes, and you end up with a computer identical to an off-the-shelf 486/33L. You don't even end up with an extra processor board when you follow this route; the upgrade process includes returning the original board.

The desktop case is a fairly compact unit, measuring just 6.5 by 19.3 by 18 inches. This isn't what you would typically term a small-footprint machine, but it's smaller than the typical IBM PC AT case that many people find too large to put on a desktop.

The 486/33L has space for five half-height drives, three stacked vertically on the front of the case for removable storage media and two mounted internally. The ample 300-watt power supply with five device connectors can handle a full house of drives and as much memory as the system design can take—which is plenty.

The basic configuration comes with 4MB of RAM, mounted on the motherboard in SIMMs. After the initial 4MB, all memory in the 486/33L goes on a card plugged into a special 32-bit high-speed memory expansion slot. If your budget can bear it, this system can hold up to 100MB of RAM. Like IBM, Compaq charges so much for memory upgrades that adding more memory than you'll actually use can be a bad budget decision. A typical memory upgrade of 8MB will set you back \$3,999.

Beyond the processor board slot and the memory card slot, the 486/33L has seven more add-in board slots, all 32-bit EISA slots that can take 8-bit or 16-bit ISA cards. A standard configuration using the motherboard video circuitry and on-board I/O leaves six free slots—a goodly number in this relatively small form factor.



Compaq 486/33L, \$26,059.

Compaq makes its own motherboard, which includes 128K of 25-nanosecond processor RAM cache memory. There's a socket for an optional Weitek 4167 math coprocessor on the processor card.

In this field of very fast machines, the 486/33L fared well on our benchmark tests. Unlike many of the systems in this review, however, this PC had an uncached disk controller and no external cache. Considering these circumstances, the 486/33L shines. In addition, the video scores were among the fastest we saw.

This machine is positioned as Compaq's fastest desktop computer. You can save \$4,000 by purchasing a 33-MHz 386 EISA machine in the same form factor, or you can buy a 25-MHz 486 EISA in a full-size desktop case for \$2,500 less than the full-tilt 33-MHz EISA 486 we reviewed.

Compaq's one-year parts-and-labor warranty is fulfilled by its dealer service channel. Compaq relies solely on dealer sales and service, simplifying buying-channel decisions and maintaining tenacious dealer loyalty. You'll have to weigh this policy against the service-and-support performance of your individual dealer. Dealer service reputations vary widely, and you'd be wise to get recommendations from other Compaq owners.

You certainly can't go wrong with the Compaq 486/33L. Its solid design, reasonably small case, and expansion capacities make it an ideal standalone computer for users with very high-end needs. Even with a possible discount of up to one-third off of the list price, you'd end up paying twice the price of the cheapest ma-

be a smarter choice (at \$6,990 for the standard configuration).

If you want the 32-bit bus and other advanced features of EISA without the heft of the tested tower unit, you can get the C² Saber 486 EISA in a mini-tower case for \$100 less or a desktop case for \$145 less. This system is worth investigating before you purchase an EISA computer, but the cost-conscious may find better values elsewhere.

COMPAQ COMPUTER CORP.

Compaq 486/33L

by Bruce Brown

Compaq Computer Corp. helped write the EISA book. As one of the major members of the Gang of Nine that originally established the EISA standard, Compaq sells a variety of high-end EISA machines. The Compaq 486/33L scores high on memory expansion capacity, boasts excellent overall design and construction quality, and as usual comes at a list price higher than you'd pay for most small new cars.

The retail price for a Compaq 486/33L in our standard configuration is \$19,846. For that price you get 8MB RAM, a 320MB ESDI Seagate hard disk rated at 18 milliseconds, one 1.44MB floppy disk drive, and motherboard-based VGA capability. Our review machine originally

COMPUTERS

EISA 486/33s

FACT FILE

EDITORS' CHOICE

Compaq
486/33L
Compaq
Computer
Corp., P.O.
Box 692000,
Houston, TX
77070; 800-231-0900, 713-370-0670.

List Price: With 4MB RAM, 128K processor RAM cache, 1.44MB floppy disk drive, VGA color display subsystem, \$14,698; with 8MB RAM, 320MB hard disk, DOS 4.01, \$19,846; with 12MB RAM, 525MB tape backup, 1.2MB and 1.44MB floppy disk drives, Advanced Graphics 1,024-by-768 video adapter, OS/2 1.2, 2,400-bps modem, \$26,059.
In Short: The Compaq 486/33L is a desktop 33-MHz system that's long on engineering and high in price. This fairly compact unit is just right for high-end applications funded by big budgets.

CIRCLE 848 ON READER SERVICE CARD

chines in this review, but the investment may be worth the cost for the Compaq quality and reputation.

DATAWORLD INC.

Dataworld Data 486i EISA

by John R. Quain

At first glance, the big and brawny \$11,367 Dataworld Data 486i EISA is a formidable-looking and formidably priced machine. On closer inspection, though, some nuances appear that may make you doubt its strength.

As we're constantly reminded, big isn't necessarily better, although the Data's 24.4-by-6.8-by-27-inch case has plenty of room for those who are trying to tame a large LAN. Of the ten 32-bit expansion slots on this machine, only two are filled. One is surrendered to an Orchid ProDesigner II Super VGA board, bearing the well-regarded Tseng 4000 chip set, and the other is filled by the ESDI UltraStor controller for the 322MB Siemens hard disk (Dataworld manages to save a slot because the two COM and two LPT ports are wired directly from the motherboard). Our \$11,802 unit also came with a TEAC 1.2MB and a Sony 1.44MB floppy disk drive, as well as a Colorado tape backup. And there was still room for three half-height drives.

Memory restrictions were not a problem, either. Loaded with 8MB of 80-nanosecond SIMM-based RAM, the motherboard can handle a total of 64MB (\$250 for each 4MB hop up the memory ladder). Though it currently has no external RAM cache, the system board can accommodate an anticipated 256Kb chip from Intel.

We also found the system documentation surprisingly good, although we were amused to find a "getting started" videocassette on the basics of PCs. This is not a machine for novices.

The system's drawbacks became apparent quickly, and the Data 486i EISA gave the impression that things were not quite nailed down yet. For example, the system board's keyboard connector had a mini DIN jack, but the keyboard shipped with the unit required the standard AT DIN jack (an adapter was cable-tied to the chassis). There were also two wire patches on the motherboard, indicating changes. Furthermore, in the course of our benchmark tests, PC Magazine Labs detected a beta Phoenix ROM BIOS in the machine. System board maker Intel verified at press time that there will be "no material changes" in the production-level ROM BIOS.

Furthermore, the 486 chip had a heat sink attached to it. Though vendors occasionally use heat sinks, this one seemed to create more heat on the processor than it dissipated (there's just one fan in this massive box).

The Data 486i EISA's performance doesn't make up for these shortcomings, either. Processor speed, as one would expect, was competitive with the rest of our 486 EISA lineup, but in the hard disk scores there was nothing special to report; the machine landed in the middle of the pack. Video test scores were a little better than most, but again, nothing set this computer apart from the other erstwhile file servers.

The Focus keyboard (which also accompanied several other machines in this roundup) has a translucent cover that tends to get in the way. By pulling off the side clamps, you can remove the cover. Nevertheless, it's a loud clicking keyboard with little travel, and it has a tendency to create finger fatigue. The 14-inch Matsushita Super VGA monitor was adequate, but all in all it didn't seem to warrant the premium price tag.



Dataworld Data 486i EISA, \$11,802.

For tech support, the company offers a toll-free help line in addition to one-year parts-and-labor on-site coverage supplied by TRW.

If you like the expandability of the roomy chassis, Dataworld offers a stripped-down 486 EISA machine. But it will still cost you \$8,630 with only one floppy disk drive, no hard disk, no software, and monochrome graphics only. A far more substantially equipped ISA 486/25 from Dataworld lists for considerably less: \$5,372 for a desktop system with



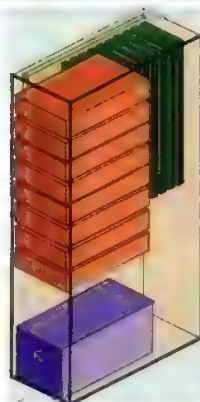
FACT FILE

Dataworld Data 486i EISA

Dataworld Inc.,
3733 San Gabriel
River Pkwy., Pico
Rivera, CA 90731;
800-736-3282,
213-895-3777.

List Price: With 4MB RAM, 1.2MB or 1.44MB floppy disk drive, Hercules monochrome display subsystem, two parallel and two serial ports, \$8,630; with 8MB RAM, 322MB hard disk, Super VGA color display subsystem, \$11,367; with both floppy disk drives, tape backup, \$11,802.

In Short: The Dataworld Data 486i EISA promises tremendous LAN server capacity. Unfortunately, its price and apparent lack of preparedness will cause customers to search for bigger boxes elsewhere.



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8MB of RAM, a 300MB hard disk, and a Super VGA color display subsystem.

If size is all that counts, you might be happy with the Dataworld Data 486i EISA. But you'll have to live with a relatively untested ROM BIOS, average benchmark test scores, and a machine that we considered not quite ready for prime time.

DYNA MICRO INC.

Dyna Work Master 486 33 EISA

by Kellyn S. Betts

Are you looking for an computer that's also a conversation piece? Dyna Micro's first EISA machine, the Dyna Work Master 486 33 EISA, is housed inside an attractive black marble-finished case and certainly has a distinctive look. The computer's short and wide tower case (26 by 11 by 18 inches) has wheels for easy movement and a smoke-colored plastic door to protect the floppy disk drive.



Dyna Work Master 486 33 EISA, \$9,999.

Unfortunately, its looks are also its most noteworthy attribute.

For a \$9,999 list price, the dealer-distributed Work Master provides 8MB of RAM, a 320MB hard disk, 1.2MB and 1.44MB floppy disk drives, and a Super VGA subsystem. Although you can expect a healthy discount, its benchmark test results hardly put it at the head of its class.

The Work Master we reviewed came

with a 320MB Seagate/Imprimis hard disk rated at 18 milliseconds and teamed with an UltraStor EISA controller that included 512K of RAM cache. The controller supports the hard disk only so the user must dedicate an additional slot to a floppy disk drive controller. While the drive-and-controller combo's scores appeared midrange on our disk benchmark tests, the 14.83-ms. BIOS Disk Seek score is quite good for the disk's 18-ms. rating. (The Work Master is one of few systems whose caching controller performs a disk seek.)

On our processor tests, the Intel components on the Advanced Integration Research motherboard performed on the slow side. But even the inclusion of an Orchid ProDesigner II Super VGA board with 1MB of video RAM didn't make the system's video test scores stand out.

Though the Work Master's performance falls short of stellar, this should not mean major problems for people interested in using the system as a graphics workstation alternative or a network server. Even with three slots taken up by components, it has five 32-bit slots free for any use you might dream up; with one full-height hard disk and two half-height floppy disk drives installed, it still has room for six more half-height drives. Because of the machine's bulk, you might expect to find more free space inside it, but what's there is certainly sufficient.

The Dyna Work Master 486 33 EISA is the top of Dyna Micro's line and one of the two EISA offerings. The company specializes in custom configuration and also offers a complete line of IBM-compatible 286, 386, and 486 ISA machines. Dyna Micro offers the standard one-year parts-and-labor warranty and provides on-site service through Integrated Automation. Fallback factory service is available for customers in remote locations, and customers pay only to ship the faulty parts back. If a machine needs repairs within the first 30 days, Dyna Micro pays all shipping expenses. Technical support is provided toll-free through Integrated Automation as well as by SAI; the latter also operates a bulletin board. Machines can be returned for a full refund within the first 30 days.

The Dyna Work Master 486 33 EISA is an excellent computer to consider if you want an unusual machine next to your desk. The rest of the picture is perfectly ordinary. If you're looking for the last

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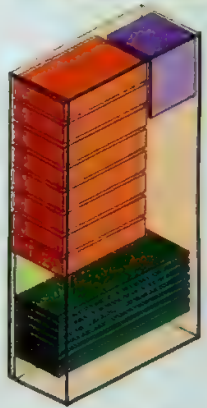
Dyna Work Master 486 33 EISA

Dyna Micro Inc., 30 W. Montague Expwy., San Jose, CA 95134; 800-336-3962.

List Price: With 4MB RAM, 256K processor RAM cache, 1.2MB or 1.44MB floppy disk drive, Super VGA video adapter, VGA color monitor, DOS 3.3 or 4.01, \$5,399; with 8MB RAM,

182MB hard disk, \$6,999; with 320MB hard disk and caching controller, both floppy disk drives, Super VGA display subsystem with 1MB video RAM, \$9,999.

In Short: The most distinctive element of the Dyna Work Master 486 33 EISA is its black marble-finished case. Inside, the system fails to impress in terms of price versus performance, even after you take a 30 percent dealer discount off the near-\$10,000 list price.



CIRCLE 604 ON READER SERVICE CARD

word in performance or the lowest price possible, you'd probably be better off choosing performance over prettiness.

FORTRON/SOURCE CORP.

Fortron NetSet 486-33 EISA

by John R. Quain

As one might surmise from the name NetSet, the \$7,950 Fortron NetSet 486-33 EISA PC is hoping to hook users trolling for a sturdy file server. Too bad it isn't special enough to receive recommendation; it has more than a few small holes that need mending.

Certainly Fortron/Source Corp.'s price is not out of line with the rest of the machines in this lineup, and the machine offers as much in the way of features as anyone else: 8MB of on-board SIMM RAM, a 330MB SCSI hard disk with 512K of cache, 1.2MB and 1.44MB TEAC floppy disk drives, a Super VGA color display subsystem, and a Logitech serial mouse. The Seagate hard disk did not perform well on our tests; moreover, RAM upgrades are pricey at \$150 per megabyte, and the 14-inch monitor supplied with the system will disappoint those looking for CAD capabilities.



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- Mouse
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- 45-Day money-back guarantee
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386/33MHz: 80MB IDE HDD, 1MB Video RAM	\$2,595
486/25MHz ISA: 210MB IDE HDD, 1MB Video RAM	\$3,595
486/33MHz ISA: 210MB IDE HDD, 1MB Video RAM	\$4,350
486/25MHz EISA: 150MB ESDI HDD, 1MB Video RAM	\$5,195
486/33MHz EISA: 150MB ESDI HDD, 1MB Video RAM	\$5,995

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Fortron NetSet 486-33 EISA, \$7,950.

Disk and video performance results were far from awe-inspiring. The Super VGA Paradise chip set didn't put on an abysmal showing, but overall it sunk to the bottom five. Direct to Screen time was particularly slow at 2.03 seconds. The uncached DPI SCSI hard disk controller will save you some IRQs, but it will also cost you some time. DOS File Access test results were disappointing for both large and small records, putting the Fortron in the bottom quarter of the group for disk scores. Variable File Size disk test results were not much more promising.

On the other hand, Fortron showed some of the fastest processor results—admittedly in a tightly packed crowd. The 64K of 15-nanosecond Intel RAM cache and 70-ns. RAM seemed to help here.

The Fortron is a business-only FCC Class A machine. It arrived in a solid, well-built tower chassis, but you'll find the same skin on several others in this roundup. It's a locking case with a cover over the top that prevents cable manglers from pulling out the wrong connection. The main drawback is that you have to wind all I/O cables along the top and out the back of the case, including the connection for the keyboard, thus reducing its freedom of movement. Behind the lockable swinging front door, you'll find the keyboard lock and reset buttons. To expose your I/O connections, you slide the top off and swing out the side panel so that all the expansion slots are revealed.

All eight slots on the AMI motherboard are 32-bit. The I/O board, Super VGA adapter, and DTP SCSI disk con-

troller ate up three, leaving five open—enough for a server. Of course, you can connect additional SCSI devices to the SCSI controller. With the hard disk and two floppy disk drives, there were still six half-height bays open.

On closer inspection, we noticed that the hard disk controller card was not set properly in its rear bracket. This was easily rectified, but it indicated some hurried assembly. The keyboard connection, which was slightly offset in the case, made plugging in the DIN connector difficult. Otherwise, all the interior cables and cords were properly secured and tucked out of the way. The case also boasts two fans along with a thermal sensor. Therefore, when things begin to heat up, the fans work overtime in order to compensate.

Fortron's machines are sold through dealers and mail-order houses, with a one-year on-site service warranty fulfilled by General Electric. Rural users take note: GE will service your PC only as long as you're within 100 miles of a GE service center.

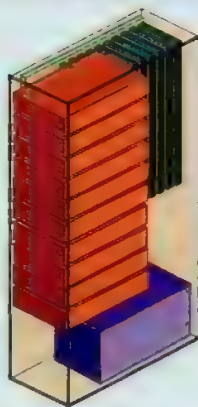
The NetSet 486-33 EISA is Fortron's top offering, but in this group it failed to snare many kudos. Despite the low price, its weak benchmark test scores and awkward box may provoke you to look elsewhere.



FACT FILE

Fortron NetSet 486-33 EISA
Fortron/Source Corp., 6818-G Patterson Pass Rd., Livermore, CA 94550; 800-821-9771, 415-373-1008.

List Price: With 4MB RAM, 200MB hard disk, 64K processor RAM cache, 1.2MB and 1.44MB floppy disk drives, Super VGA color display subsystem, DOS 4.01, \$6,950; with 8MB RAM, 330MB hard disk, Microsoft Windows 3.0, Logitech mouse, \$7,950.
In Short: Nothing about the NetSet 486 particularly caught our eye. It was a bit slower than the other fish in the sea, but the Fortron's price seems competitive and its construction adequate. If you end up purchasing this system, make sure your dealer throws in a keyboard-cable extender.



CIRCLE 622 ON READER SERVICE CARD

HIQUALITY SYSTEMS INC.

Hi-Q 486/33 EISA

by Fredric Burke

There are those companies that employ exotic, expensive memory-management schemes to wring the last iota of performance out of the 80486 chip, and there are those which realize that the chip's native advantages make it attractive enough without having to pour on extra features and add attendant costs. HiQuality Systems' effort in the 80486 arena, the \$5,999 Hi-Q 486/33 EISA, reflects the latter philosophy. While it would function well as a small network server, it would be most useful as a desktop machine, where its far-from-modest abilities would allow it to shine.

HiQuality's computers are well constructed and inexpensive in the light of their processing capabilities. The basic configuration of the Hi-Q costs only \$4,699; it differs from the unit we tested by having 4MB of RAM instead of the 8MB we requested, a 100MB IDE hard disk instead of the 347MB ESDI disk, and a Trident Super VGA video adapter in place of the Orchid ProDesigner II Super VGA adapter, which also has 1,024-by-768 resolution capability.

Inside our tested unit was a Free Technology motherboard supporting an Intel chip set and Award's popular 486 BIOS. HiQuality complements the internal cache of the 486 chip with an external nonexpandable 64K RAM cache. The Hi-Q supports simultaneous use of a Weitek 4167 coprocessor chip.

HiQuality also built in industry-standard expansion capabilities. Although our tested unit came with 8MB of system RAM, the motherboard will support up to 64MB without having to rely on an add-in memory board, as some of the Hi-Q's competitors do. The expansion chassis features two 16-bit and six 32-bit slots. The video, I/O, and the Bustek drive controller card take up three 32-bit slots, leaving two 16-bit and three 32-bit slots free. Drive bay availability is unremarkable, if representative of the industry; there is space for six half-height devices in the machine.

The Hi-Q turned in average scores on all of our benchmark tests, falling into the middle of the pack for disk and video tests and performing slightly below average on our 80486 Instruction Mix test.

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80386 Computer Kit

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- 101-key keyboard • Multi I/O Card
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- DR DOS 5.0 and QAPLUS diagnostic software

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CIRCLE 179 ON READER SERVICE CARD

Please refer to Mail Key 10 when ordering





Hi-Q 486/33 EISA, \$5,999.

Users looking for a larger hard disk will end their search with a choice between a \$2,095 680MB ESDI unit and a similarly priced SCSI drive; HiQuality does not currently offer a larger hard disk, though most users will find one of these large enough. The company supplies both 1.2MB and 1.44MB TEAC floppy disk drives in the basic and tested configurations, as well as DOS 4.01, *Microsoft Windows 3.0*, and a HiQuality serial mouse.

HiQuality's service policy is reason-

COMPUTERS

EISA 486/33s

The Blue Max Monolith 486E/330CD is a full-size desktop machine, but it has expansion limitations in terms of extra drives and I/O cards.



Blue Max Monolith 486E/330CD, \$8,996.

able, with one-year coverage on parts and two years on labor. The company will ship parts in response to a phone request but does not provide on-site service.

The Hi-Q 486/33 EISA is not the machine to be looking for if you want the latest and greatest in speed. It offers instead a conservative approach in its effort to provide good value.

INTERNATIONAL INSTRUMENTATION INC.

Blue Max Monolith 486E/330CD

by Fredric Burke

International Instrumentation has added to its Blue Max line with the \$7,997 Monolith 486E/330CD, a notable machine in this burgeoning market segment. Although it's expensive for a relatively unknown computer, the Monolith 486E/330CD is well suited for the tasks that 80486-based machines will be called on to do. And while perhaps not a bargain, the Monolith is well constructed and capable. The \$7,997 price includes 8MB of RAM, a 300MB hard disk, a controller with 512K of disk cache, one floppy disk drive, and a Super VGA video subsystem. Our system included two floppy disk drives and a 4MB disk cache; it sells for \$8,996. For those who balk at paying that much for anything, International Instrumentation makes a basic configuration of the Blue Max Monolith 486E/330CD available for \$4,497. This price includes 4MB of RAM, a 1.2MB or 1.44MB floppy disk drive, a

monochrome VGA monitor, and DOS 4.01. This version of the Blue Max Monolith does not come with a hard disk.

International Instrumentation has chosen premium-quality components with which to build its 486 EISA. AMI supplies both the Enterprise motherboard and the EISA BIOS, and Intel manufactures the chip set. Our tested unit also came with a 64K external processor RAM cache to complement the 80486 chip's native 8K cache; it can be expanded to 256K by using 64K chips. The motherboard also has a plug for a Weitek 4167 coprocessor, and the Blue Max Monolith 486E/330CD allows both coprocessors to work simultaneously—a feature that 486 users should demand.

The Monolith's basic 4MB RAM, comprised of 80-nanosecond SIMMs, can be expanded to 96MB, which is above the standard for this class of machine. The motherboard will support 32MB, and users can install a \$249 32-bit proprietary add-in card that supports an additional 64MB. Memory isn't cheap: 96MB costs \$11,025.

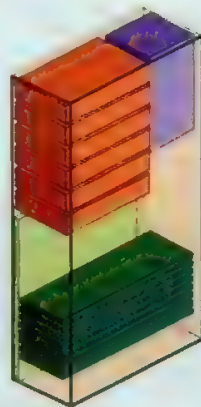
The Blue Max Monolith 486E/330CD is a full-size desktop machine, but it does exhibit expansion limitations, especially in terms of extra drives and I/O cards. The full-size Hewlett-Packard 300MB ESDI drive (rated at 15 milliseconds) robs the machine of two of its five half-height drive bays. Those users concerned with having as many drive bays available as possible should specify a half-height drive. Our tested unit also came with a Fujitsu 1.2MB and a Toshiba 1.44MB floppy disk drive.

FACT FILE

Hi-Q 486/33 EISA
HiQuality Systems
Inc., 740 N. Mary
Ave., Sunnyvale, CA
94086; 408-245-
5836.

List Price: With 4MB RAM, 100MB hard disk, 64K processor RAM cache, 1.2MB and 1.44MB floppy disk drives, Super VGA color display subsystem, DOS 4.01, *Microsoft Windows 3.0*, mouse, \$4,699; with 8MB RAM, 347MB hard disk, Super VGA video adapter with 1MB RAM, \$5,999.

In Short: HiQuality Systems sells its reasonably priced Hi-Q 486/33 EISA with a solid set of no-frills components. No on-site service is available.



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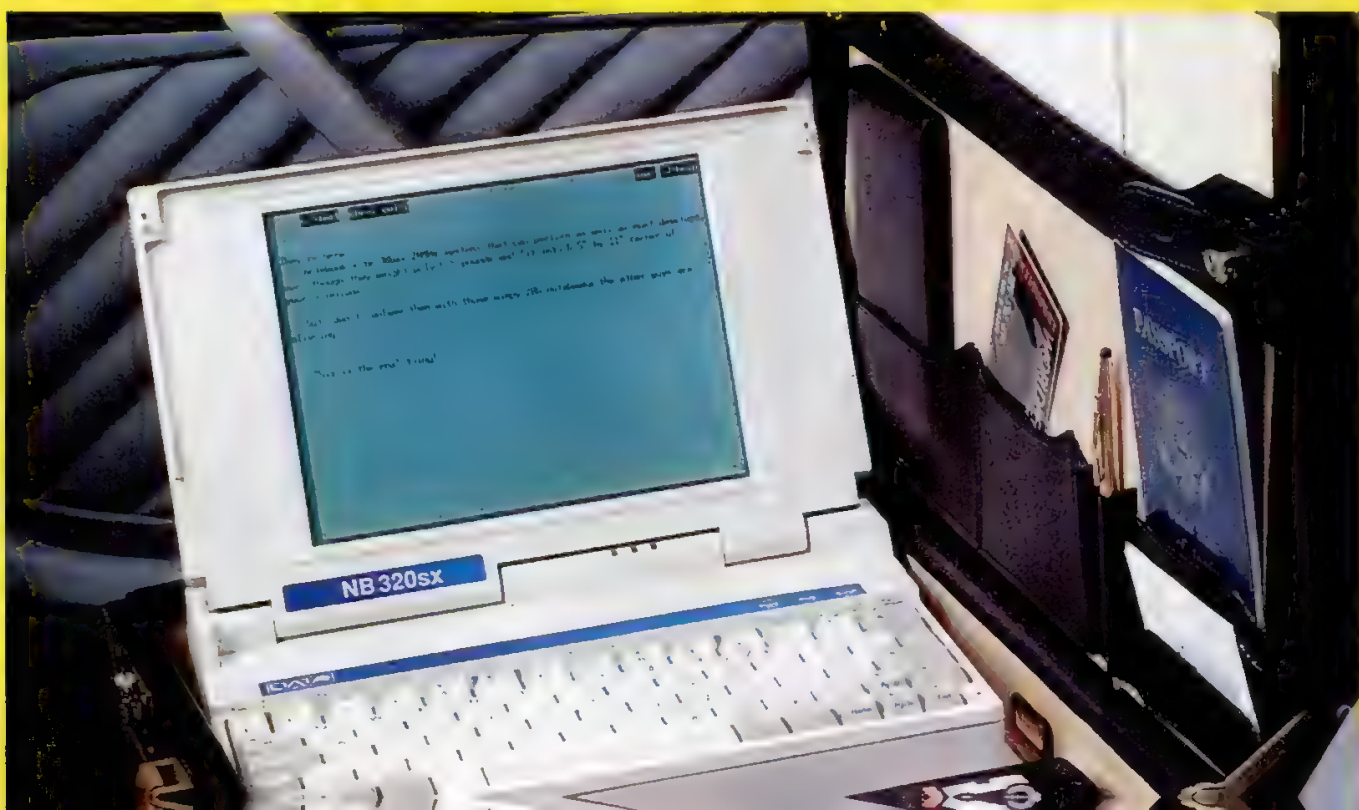
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While the Compaq Portable 386 and Toshiba T5200 are priced over \$8,000 each you can have the LP-320 for \$2,750!

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WORLD**

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Sept. 3, 1990

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Recently, the editors at InfoWorld magazine compared our new portable laptop LP-320 (setup value \$3,025) to Compaq's Portable 386 (setup value \$8,997) and Toshiba's T5200 (setup value \$8,497). Here's some of what InfoWorld said:

- 1) Speed: "Dataworld's disk-intensive total was the best"
- 2) Screen: "VGA-compatible screen that has a dark-and-bold font that is unusually sharp"
- 3) Battery: "No other system in this comparison (Compaq nor Toshiba) supports a battery"
- 4) Support: "Helpful technicians who accurately answered our questions"
- 5) Value: "The Dataworld system is a great value. This is a solid buy"

LP320 Laptop Standard Features

- Intel 386DX 32-bit 20MHz CPU
- LCD VGA Super Twist Screen 640x480
- 1MB DRAM (upgrade to 8MB)
- Conner 43MB IDE High-Speed Hard Drive & Controller Card
- 80387 & 80287 Support
- 3.5" 1.44MB Floppy
- Sleep Mode to Conserve Battery Power
- 1 parallel, 2 serial ports
- Separate 10-Key Numeric Keypad
- 1 Expansion Slot
- AC Adapter
- Carrying Bag
- FastLynx Laptop-to-PC Software & Cables Kit

LP320 Laptop Optional Features

- Conners 120MB or 200MB Hard Drive
- Matsushita or NEC Full-Size VGA Monitor
- Math Coprocessor Intel or iIT
- 20MB to 500MB External Tape Back-Up
- Mouse
- Fax/Modem or Network Card
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- Automobile Lighter Adapter

LP/320 \$2,750

20MHz/LCD VGA/1MB/43MB HD

LP/325 \$3,495

25MHz/LCD VGA/1MB/43MB HD



Standard Features

- Intel 386 25MHz or 486 25MHz CPU
- 80387 & 80387 Support
- 3.5" Floppy Drive
- 1 Parallel, 2 Serial Ports
- 2 16-bit ISA Expansion Slots
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EISA 486/33s

FACT FILE

Blue Max Monolith 486E/330CD

International Instrumentation Inc., 2282

Townsgate

Rd., Westlake Village, CA 91361; 800-543-3475, 805-495-7673.

List Price: With 4MB RAM, 64K processor RAM cache, 1.2MB or 1.44MB floppy disk drive, VGA video adapter and monochrome monitor, mouse port, DOS 4.01, \$4,497; with 8MB RAM, 300MB hard disk and 512K caching controller card, Super VGA color display subsystem, DOS 4.01, \$7,997; with 4MB caching controller card, both floppy disk drives, \$8,996.

In Short: In the solidly constructed Blue Max Monolith 486E/330CD, memory expandability to 96MB is offset by a shortage of drive bays.

CIRCLE 548 ON READER SERVICE CARD

The motherboard includes seven 32-bit slots (two of which are used by the Orchid Super VGA and Perstor UltraStor card controller cards) and a single 8-bit

slot. One of the 32-bit slots is also used for the proprietary memory card.

The Blue Max Monolith 486E/330CD performed slightly below average on our processor benchmark tests but better than average on our video tests. These differences may be negligible for most users in view of the extremely narrow range of scores for our test group.

Although a variety of network cards are available for the Monolith, its greatest strength may be as a desktop machine in a CAD or DTP environment. Its memory-expansion capability is perfect for the demands of these applications, and its relatively limited expansion chassis works against using it as a host. In a small network environment, this will not be a pressing concern.

The Blue Max Monolith 486E/330CD comes with a one-year warranty on parts and labor and is backed by on-site service as well.

Although the Monolith 486E/330CD is more expensive than some comparable machines in our lineup, it is nonetheless a

If you can overlook the machine's expansion limitations, the Blue Max Monolith 486E/330CD is definitely worth taking a look at.

strong contender for honors in this class. The chassis is rock-solid, and the internal components that grace it are proven pieces.

If you can overlook the machine's expansion limitations, the Blue Max Monolith 486E/330CD is definitely worth taking a look at.

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JAN 1991

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33-MHz 486-BASED EISA SYSTEMS: SUMMARY OF FEATURES

Price of standard configuration For this review of 33-MHz 486 computers, we requested a standard configuration including 8MB RAM, RAM cache if available, a 200MB hard disk or better, one high-density floppy disk drive, a Super VGA color video display subsystem, at least one parallel and two serial ports, a keyboard, and DOS. All 22 PCs reviewed here provide a reasonably close match for this list of requirements.

The price of the standard configuration is followed by the **hard disk capacity**. All other table entries describe the features of the systems *PC Magazine* actually tested. Refer to each fact file for the price of the tested configuration.

Distribution channel Some machines are sold direct, others through dealers. Dealers often offer discounts of 25 percent or more off the list price (although there is no guarantee that the discounts will run this high).

The **486 chip set** is the support logic that connects the CPU with the other functions managed by the motherboard. At present, only Intel manufactures an EISA chip set.

System RAM arrangement refers to the method in which memory is addressed. Different arrangements aim at avoiding the wait states imposed when CPU speed outpaces conventional memory speed.

Page-mode architecture allows back-to-back memory accesses within banks of RAM defined as pages, avoiding wait states.

Interleaved RAM arrangement divides memory into two or four portions that process information alternately. The CPU sends information to one section for processing while another section goes through a refresh cycle.

Row/column, the original method of accessing data, is a subset of page-mode and interleaved page-mode memory architectures. 486-based systems never use row/column addressing alone.

Installable 32-bit RAM indicates the minimum and maximum amount of 32-bit memory that can be installed, using any combination of chips and proprietary cards.

RAM packaging (and rated speed) Memory comes in a variety of packages: DIPs, SIPs, and SIMMs. Rated speeds typically range from 60 to 80 nanoseconds for main memory (dynamic RAM) and 15 to

30 nanoseconds for cache RAM (static RAM).

The traditional **DIP** (*dual in-line package*) chip, commonly used for fast cache RAM, sprouts 4, 7, 12, 20, or more metal legs on both right and left sides.

SIPs (*single in-line packages*) are single-package arrays of computer chip logic assembled so that all connecting legs are in a straight line, like the teeth on a comb. They can be individual chips or multiple chips on a small card, with a proprietary SIP connection.

SIMMs (*single in-line memory modules*) consist of individual logic devices installed on a small circuit board that plugs into a larger device, such as a motherboard. SIMMs are easily installed and replaced.

Chip size Kb and Mb refer to kilobits and megabits, respectively. Combination chips (4x256Kb) are generally faster and more expensive.

The **BIOS version and date** can affect *PC Magazine* Labs' benchmark test results. Those purchasing the same machine with a different BIOS version may encounter some variations in performance.

Setup can reside either on a floppy disk or in ROM.

Shadowing Shadow RAM is a technology that loads video BIOS or system BIOS directly into fast RAM on boot-up of the computer, offering enhanced performance speed. It uses a segment of system memory located between the boundary of conventional memory (640K) and the end of the first megabyte of installed RAM. The ability to disable shadowing is important with some applications to resolve memory conflicts.

Hard disk interface Within the 386 and 486 PC environments, the most common hard disk interfaces are **IDE** (*integrated drive electronics*), **SCSI** (*small computer system interface*), and **ESDI** (*enhanced small device interface*). With an IDE interface, the drive contains its own controller electronics; by contrast, each hard disk in this roundup has its controller on a card.

Bus speeds Bus speed becomes more important as computers run at faster clock speeds. A computer's bus speed may actually be too fast for expansion cards, most of which operate at 8 MHz.

Slots free in fully configured PC indicates the number of open slots after disk drive controllers, a display subsystem, and one parallel and two serial ports are installed.

The **display circuitry** can reside on an expansion card or on the motherboard. Motherboard circuitry is often faster, but if it cannot be disabled it can't be upgraded.

DOS versions and prices are listed here. If no price is shown, the base-priced system includes DOS. (*PC Magazine's* standard configuration includes DOS 4.01—or, if it is not available, DOS 3.3—to allow more-accurate price comparisons.)

Where **OS/2** is available, the version number and list price are provided.

Disk caching software Software such as SMARTDRV.SYS or *Super PC-Kwik* facilitates data retrieval from the hard disk. It is listed here if the vendor supplies it free of charge.

Expanded memory manager software emulates the Lotus/Intel/Microsoft (LIM) expanded memory manager within the extended memory of a 386 or 486 PC.

Other software is listed only if bundled free of charge.

Number of device connectors indicates how many internal storage devices the power supply can support without requiring Y cables (power splitters).

FCC certification class A Class A rating signifies that a computer has sufficiently low radio-frequency emissions for operation only in a business locale. The more stringent Class B rating indicates that a system is safe for use at home without interfering with televisions or other electrical devices. Each system with this rating has an **FCC Class B identification number**. To verify a PC's certification, you can dial up the Public Access Link, the FCC's own bulletin board service, at 301-725-1072.

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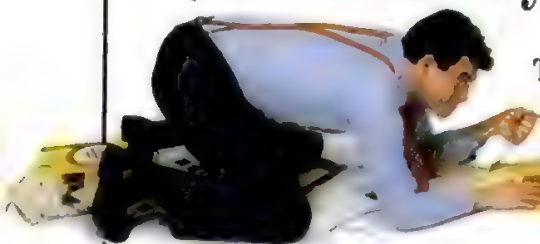
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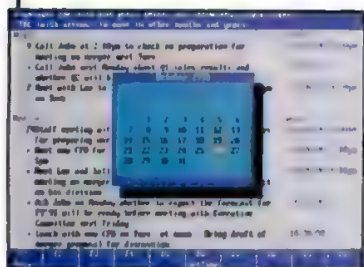
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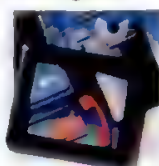
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33-MHZ 486-BASED EISA SYSTEMS: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	ACMA 486/33 EISA	ALR PowerCache 33/4e	Amax 486/33e	Bus 486/33 EISA	C2 Saber 486 EISA	 Compaq 486/33L
Price of standard configuration	\$7,995	\$15,562	\$9,300	\$6,849	\$8,100	\$19,846
Hard disk capacity	360MB	330MB	346MB	300MB	339MB	320MB
Distribution channel	Direct	Dealers	Dealers	Dealers, direct	Dealers	Dealers
Case type	Tower	Tower	Tower	Desktop	Tower	Desktop
Dimensions (HWD, in inches)	24.5 x 7.5 x 17.5	23.5 x 7.5 x 18.5	24.5 x 7.5 x 17.5	6.5 x 21 x 16.5	25.5 x 7.5 x 17.5	6.5 x 19.3 x 18
Motherboard manufacturer	Free Technology	ALR	Free Technology	Micronics	Free Technology	Compaq
486 chip set manufacturer	Intel	Intel	Intel	Intel	Intel	Intel
System RAM arrangement	Page-mode	Interleaved, page-mode	Page-mode	Page-mode	Interleaved, page-mode	Page-mode
MEMORY						
Installable 32-bit RAM	1MB-64MB	8MB-128MB	1MB-64MB	4MB-64MB	1MB-64MB	4MB-100MB
RAM packaging (and rated speed)	SIMM (70 ns.)	SIMM (80 ns.)	SIMM (70 ns.)	SIMM (70 ns.)	SIMM (80 ns.)	SIMM (80 ns.)
Chip size	1Mb	1Mb	1Mb	1Mb	1Mb	1Mb
PROCESSOR RAM CACHE						
Cache controller	Discrete logic	ALR	Discrete logic	Intel	Free Technology	Discrete logic
Installed RAM	64K	128K	64K	64K	64K	128K
Other installable RAM options	256K	None	256K	128K, 256K	128K, 256K	None
RAM packaging (and rated speed)	DIP (20 ns.)	DIP (25 ns.)	DIP (25 ns.)	DIP (15 ns.)	DIP (25 ns.)	DIP (25 ns.)
Chip size	8x8Kb	128Kb	8x32Kb	64Kb	64Kb	128Kb
BIOS						
BIOS version	Award 4.0	Phoenix 1.00.04	Award 4.1	Phoenix 1.10.11	Award 4.1	Compaq 386E1
Date	1990	January 1988	1990	January 1988	April 1990	August 1990
Setup/Password in ROM	■ / □	■ / □	■ / □	■ / □	■ / □	□ / ■
Video shadowing/System shadowing	■ / ■	□ / ■	■ / ■	■ / ■	■ / ■	□ / □
DISK DRIVES						
Hard disk capacity and interface	360MB ESDI	330MB ESDI	346MB ESDI	155MB ESDI	339MB ESDI	325MB ESDI
Manufacturer	Maxtor	Seagate	Maxtor	NEC	Maxtor	Seagate
Average access time	16 ms.	16 ms.	16 ms.	15 ms.	14 ms.	18 ms.
Controller manufacturer	UltraStor	UltraStor	UltraStor	DTC	UltraStor	Western Digital
Controller location	Card	Card	Card	Card	Card	Card
Drive bays	6 half-height	1 full-height, 4 half-height	6 half-height	5 half-height	7 half-height	5 half-height
Hard disk options	150MB-676MB	150MB-1.2GB	300MB-1GB	155MB-670MB	40MB-675MB	150MB-325MB
Floppy/hard disk controller	□	□	□	■	□	■
Floppy disk capacity	1.2MB, 1.44MB	1.2MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB
Manufacturer	TEAC	Epson	TEAC	TEAC	TEAC	Citizen, Canon
EXPANSION BUS						
Bus speeds	8 MHz	8 MHz	8 MHz	8.3 MHz	8.3 MHz	8 MHz
Expansion slots	6 32-bit (EISA); 2 16-bit (ISA)	1 8-bit, 1 16-bit, 6 32-bit (EISA)	6 32-bit (EISA); 2 16-bit (ISA)	1 16-bit, 7 32-bit (EISA)	2 16-bit, 6 32-bit (EISA)	7 32-bit (EISA); 2 32-bit (proprietary)
Slots free in fully configured PC	4	6	4	5	4	3
Ports originate on motherboard	□	■	□	□	□	■
VIDEO						
Display mode	SVGA, 1,024x768	SVGA	SVGA, 1,024x768	SVGA, 1,024x768	SVGA	SVGA, 1,024x768
Display circuitry location	Card	Card	Card	Card	Card	Card
Interface	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit
Controller manufacturer	Orchid	ALR	Orchid	Orchid	Trident	Compaq
Chip set manufacturer	Tseng	Paradise	Tseng	Tseng	Trident	Xilinx
KEYBOARD/MOUSE						
Keyboard manufacturer	Maxi-Switch	NMB	Lite-on	Chicony	Maxi-Switch	Compaq
Number of keys, function keys	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12
Keyboard cable length (inches)	72	108	72	72	54	90
Dedicated mouse port	□	□	□	□	□	■

—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

CONTINUES



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COMPUTERS

EISA 486/33s

33-MHZ 486-BASED EISA SYSTEMS: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	Dataworld Data 486i EISA	Dyna Work Master 486 33 EISA	Fortron NetSet 486-33 EISA	Hi-Q 486/33 EISA	International Instrumentation Blue Max Monolith 486E/330CD	Matrix 486-33 EISA	National Micro Systems Flash 486-33 EISA
Price of standard configuration	\$11,367	\$9,999	\$7,950	\$5,999	\$7,997	\$8,199	\$6,983
Hard disk capacity	322MB	320MB	330MB	347MB	300MB	330MB	338MB
Distribution channel	Direct	Dealers	Direct	Direct	Direct	Dealers	Direct
Case type	Tower	Tower	Tower	Tower	Desktop	Tower	Tower
Dimensions (HWD, in inches)	24.4 x 6.8 x 27	26 x 11 x 18	24.5 x 9 x 25	24.5 x 7.5 x 17.3	6.3 x 21.3 x 16.5	23 x 6.5 x 19.1	26 x 8 x 18
Motherboard manufacturer	Intel	AIR	AMI	Free Technology	AMI	Micronics	AIR
486 chip set manufacturer	Intel	Intel	Intel	Intel	Intel	Intel	Intel
System RAM arrangement	Interleaved, page-mode	Page-mode	Interleaved, page-mode	Page-mode	Interleaved, page-mode	Page-mode	Page-mode
MEMORY							
Installable 32-bit RAM	4MB-64MB	8MB-64MB	1MB-96MB	2MB-64MB	2MB-96MB	1MB-64MB	1MB-64MB
RAM packaging (and rated speed)	SIMM (80 ns.)	SIMM (70 ns.)	SIMM (70 ns.)	SIMM (80 ns.)	SIMM (70 ns.)	SIMM (70 ns.)	SIMM (80 ns.)
Chip size	4Mb	1Mb	1Mb	1Mb	1Mb	1Mb	1Mb
PROCESSOR RAM CACHE							
Cache controller	N/A	Discrete logic	Intel	TTL	Discrete	Intel	Discrete logic
Installed RAM	N/A	256K	64K	64K	64K	64K	256K
Other installable RAM options	N/A	64K	128K, 256K, 512K	256K	128K, 256K	128K, 256K	64K
RAM packaging (and rated speed)	N/A	DIP (30 ns.)	SIMM (15 ns.)	DIP (25 ns.)	SIMM (20 ns.)	DIP (15 ns.)	DIP (30 ns.)
Chip size	N/A	8x256Kb	64Kb	64Kb	64Kb	8Kb	32Kb
BIOS							
BIOS version	Phoenix	Phoenix 1.04	AMI 1.10	Award 4.1	AMI EISA	Phoenix 1.00.11	Phoenix 1.00.00
Date	January 1991	October 1990	October 1990	1990	August 1990	December 1988	January 1988
Setup/Password in ROM	■ / ■	■ / □	■ / □	■ / ■	■ / □	■ / □	■ / □
Video shadowing/System shadowing	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / □	■ / ■
DISK DRIVES							
Hard disk capacity and interface	322MB ESDI	320MB ESDI	330MB SCSI	200MB SCSI	340MB ESDI	330MB ESDI	338MB ESDI
Manufacturer	Siemens	Imprimis	Seagate	Maxtor	Hewlett-Packard	CDC	Micropolis
Average access time	18 ms.	18 ms.	18 ms.	15 ms.	15 ms.	16 ms.	18 ms.
Controller manufacturer	UltraStor	UltraStor	DPT	Bustek	UltraStor	UltraStor	UltraStor
Controller location	Card	Card	Card	Card	Card	Card	Card
Drive bays	8 half-height	10 half-height	10 half-height	6 half-height, 3 full-height	5 half-height, 4 full height	1 full-height, 2 half-height, 2 3.5-inch	8 half-height
Hard disk options	120MB-676MB	40MB-600MB	158MB-1.02GB	347MB-680MB	180MB-1.02GB	106MB-1GB	150MB-650MB
Floppy/hard disk controller	□	□	■	■	■	□	□
Floppy disk capacity	1.2MB, 1.44MB	1.2MB, 1.44MB	1.44MB, 1.2MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB	1.2MB
Manufacturer	TEAC, Sony	TEAC	TEAC	TEAC	Fujitsu, Toshiba	Epson	TEAC
EXPANSION BUS							
Bus speeds	8.3 MHz	8 MHz	8 MHz	8 MHz	8 MHz, 16 MHz	8 MHz	8 MHz
Expansion slots	10 32-bit (EISA)	8 32-bit (EISA)	7 32-bit (EISA), 1 8-bit (ISA)	6 32-bit (EISA), 2 16-bit (ISA)	1 8-bit, 7 32-bit (EISA); 7 16-bit (ISA)	1 16-bit, 7 32-bit (EISA)	8 32-bit (EISA)
Slots free in fully configured PC	8	5	5	5	5	4	5
Ports originate on motherboard	■	■	□	□	□	□	■
VIDEO							
Display mode	SVGA, 1,024x768	SVGA	SVGA, 1,024x768	SVGA	SVGA	SVGA	SVGA, 1,024x768
Display circuitry location	Card	Card	Card	Card	Card	Card	Card
Interface	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit
Controller manufacturer	Orchid	Orchid	Fortron	Orchid	Orchid	Orchid	Orchid
Chip set manufacturer	Tseng	Tseng	Paradise	Tseng	Tseng	Tseng	Tseng
KEYBOARD/MOUSE							
Keyboard manufacturer	Focus	Honeywell	NMD	Key Tronic	Maxi-Switch	KPI USA	Maxi-Switch
Number of keys, function keys	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12
Keyboard cable length (inches)	72	96	50	72	72	81	56
Dedicated mouse port	■	□	□	□	■	□	□

■—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

COMPUTERS

EISA 486/33s

Netis 486/33 EISA	Panther 486/33 EISA	PC Pros/Touche 5550T/486 EISA-33	Proteus 486/33 EISA	SAI 486/33 EISA	Tandon 486/33 EISA	 Tangent Model 433e	 Wedge 486/33 EISA	 Zeos 486-33 EISA
\$5,939	\$7,699	\$6,299	\$5,695	\$6,316	\$10,047	\$9,690	\$6,675	\$7,120
200MB	329MB	347MB	200MB	200MB	330MB	337MB	200MB	200MB
Dealers, direct	Dealers	Direct	Dealers, direct	Dealers	Direct	Direct	Dealers	Direct
Tower	Tower	Tower	Mini-tower	Desktop	Tower	Tower	Desktop	Tower
24.5 x 7.5 x 17.5	25 x 7.5 x 16	25.8 x 7.5 x 17.5	15.5 x 8.5 x 19.5	5.9 x 21 x 15.9	26.1 x 10.2 x 19.6	24.3 x 7.5 x 17.5	6.8 x 14.8 x 16.3	24.5 x 7.5 x 17.5
Free Technology	AMI	AMI	AMI	AIR	Tandon	Mylex	Wedge	Mylex
Intel	Intel	Intel	Intel	Intel	Intel	Intel	Intel	Intel
Page-mode	Page-mode	Page-mode	Interleaved	Interleaved, page-mode	Page-mode	Interleaved, page-mode	Page-mode	Interleaved
1MB-32MB	1MB-64MB	1MB-96MB	4MB-96MB	1MB-64MB	2MB-64MB	1MB-32MB	2MB-16MB	1MB-32MB
SIMM (80 ns.)	SIMM (70 ns.)	SIMM (60 ns.)	SIMM (80 ns.)	SIMM (70 ns.)	SIMM (80 ns.)	SIMM (70 ns.)	SIMM (80 ns.)	SIMM (80 ns.)
1Mb	1Mb	1Mb	1Mb	1Mb	1Mb	1Mb	8x1Mb	1Mb
Discrete logic	AMI	Discrete logic	Discrete logic	Discrete logic	Discrete logic	Discrete logic	Intel	Discrete logic
64K	128K	64K	128K	256K	64K	128K	128K	128K
256K	None	256K	None	None	None	64K	None	64K
DIP (25 ns.)	DIP (25 ns.)	DIP (15 ns.)	SIMM (20 ns.)	DIP (30 ns.)	SIMM (15 ns.)	DIP (20 ns.)	DIP (15 ns.)	DIP (20 ns.)
8x8Kb	64Kb	32Kb	1Mb	8x256Kb	64Kb	4x64Kb	8x32Kb	16x4Kb
Award 4.10	AMI 4.1	AMI	AMI 1.10	Phoenix 1.00.04	Tandon 3.62	Mylex/Phoenix	Award 4.0	Mylex/Phoenix
December 1990	August 1990	August 1990	October 1990	March 1990	July 1990	November 1990	1990	November 1990
■ / □	■ / □	■ / □	■ / □	■ / □	■ / ■	■ / □	■ / □	■ / □
■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■	■ / ■
200MB SCSI	325MB ESDI	347MB ESDI	203MB ESDI	150MB ESDI	300MB SCSI	329MB SCSI	200MB SCSI	324MB SCSI
Conner	Seagate	Maxtor	Maxtor	Imprimis	Seagate	Seagate	Maxtor	Seagate
15 ms.	14.5 ms.	15 ms.	15 ms.	16 ms.	14 ms.	10.7 ms.	15 ms.	10.7 ms.
Bustek	UltraStor	UltraStor	UltraStor	Data Technology	Mylex	Mylex	Bustek	Mylex
Card	Card	Card	Card	Card	Card	Card	Card	Card
6 half-height	6 half-height, 3 full-height	6 half-height	5 half-height	5 half-height	8 half-height	6 half-height	3 half-height, 2 3.5-inch	6 half-height, 2 3.5-inch
200MB-1.2GB	325MB-1GB	203MB-676MB	200MB-600MB	150MB-600MB	330MB-1GB	105MB-1.05GB	200MB-675MB	42MB-1.05GB
■	□	□	□	■	■	■	■	■
1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB	1.2MB	1.2MB, 1.44MB
TEAC	Fujitsu, Chinon	TEAC	TEAC	TEAC	Epson	TEAC	TEAC	TEAC
8 MHz	8 MHz	8.2 MHz	8.3 MHz	8 MHz	8 MHz	8 MHz	8 MHz	8 MHz
6 32-bit (EISA); 2 16-bit (ISA)	7 32-bit (EISA); 1 8-bit (ISA)	7 32-bit (EISA); 1 8-bit (ISA)	8 32-bit	8 32-bit (EISA)	6 32-bit (EISA); 2 16-bit (ISA)	8 32-bit (EISA)	6 32-bit (EISA); 2 8-bit (ISA)	8 32-bit (EISA)
5	5	5	5	6	6	5	5	5
□	□	□	□	■	■	□	□	□
SVGA, 1,024x768	SVGA	SVGA, 1,024x768	SVGA, 1,284x1,024	SVGA, 1,024x768	SVGA	SVGA, 1,024x768	SVGA	SVGA, 1,024x768
Card	Card	Card	Card	Card	Card	Card	Card	Card
16-bit	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit
ZPVGA	ATI	Orchid	AMD	Diamond	Orchid	Orchid	Wedge	Diamond
WDC	ATI	Tseng	Tseng	Tseng	Tseng	Tseng	Wedge	Tseng
NMB	Chinon	Key Tronic	Focus	Focus	Maxi-Switch	Key Tronic	NTC	NTC
101, 12	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12
72	72	70	72	59	72	72	72	72
□	□	□	□	□	□	□	□	□

CONTINUES



33-MHZ 486-BASED EISA SYSTEMS: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	ACMA 486/33 EISA	ALR PowerCache 33/4e	Amax 486/33e	Bus 486/33 EISA	C2 Saber 486 EISA	Compaq 486/33L
SOFTWARE						
DOS	4.01	4.01 (\$150)	4.01	4.01	4.01	3.31 (\$120), 4.01 (\$150)
OS/2	None	None	None	None	None	1.1 (\$340), 1.2 (\$340)
Disk caching software	None	None	None	None	None	None
Expanded memory manager	None	None	None	None	None	None
Other software	None	None	Windows 3.0	None	Windows 3.0	None
MISCELLANEOUS						
Supports Weitek coprocessor	■	■	■	■	■	■
Power supply (watts)	450	300	250	200	300	300
Number of device connectors	5	3	4	4	5	5
Keyboard/case lock	Front/none	None/none	Front/none	Front/none	Front/none	Front/front
Power-on/reset switch	Front/front	Top/none	Front/front	Side/front	Front/front	Front/none
Warranty	1 year	1 year	1 year	1 year	1 year parts, 5 years labor	1 year
Service	On-site	Dealer	Dealer	On-site	On-site	Dealer
FCC certification class	A	A	A	A	A	B
FCC Class B identification number	N/A	N/A	N/A	N/A	N/A	CNT75N8403

■—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

CONTINUES

MATRIX DIGITAL PRODUCTS INC.

Matrix 486-33 EISA

by Patrick Honan

The \$8,199 Matrix 486-33 EISA suffers from a case of the "ifs": If it were a bit faster, or if it cost a thousand dollars less, it might be an exceptional value. These ifs make it a solid unit with average speed and expansion options, but one that does not distinguish itself from the pack.

The Matrix 486-33 EISA comes with 8MB of RAM, a 64K external processor RAM cache, a 330MB CDC ESDI hard disk, one 1.2MB or 1.44MB floppy disk drive, an Orchid ProDesigner II Super VGA board (maximum resolution 1,024 by 768), a Relisys VGA monitor, a game port, and DOS 4.01. The only difference between the standard configuration and the tested unit was a second floppy disk drive that brought the price up to \$8,259.

Inside the 23- by 6.5- by 19.1-inch case, Matrix provides enough storage bays to handle the requirements of most network situations. Our tested unit had room for one full-height, two half-height, and two 3.5-inch devices. You can install an additional drive housing that fastens underneath the power supply. The addi-

tional bay can hold two additional half-height devices. Matrix makes the housing available at no extra charge; all you have to do is request it.

A total of 16 SIMM sockets on the motherboard accept either 1MB or 4MB SIMMs, enabling you to install the 64MB system maximum without taking up an expansion slot. The 8MB of RAM in our tested unit used 70-nanosecond 1MB SIMMs. Matrix uses extremely fast 15-ns. SRAMs for the RAM cache. The tested unit had a 64K RAM cache, which was upgradable to 256K.

The Micronics motherboard has seven 32-bit EISA slots and one 16-bit ISA slot. Four of these slots were open on the tested unit, with the VGA board occupying the ISA slot and the hard disk controller, floppy disk drive controller, and I/O board filling three of the EISA slots. Four open slots may seem inadequate; indeed, the addition of a network interface board, tape drive controller, modem, and other peripherals can quickly eat up these slots. You will have to consider your needs carefully if you plan to make the Matrix 486-33 EISA a fully functional server.

The combination of the Ultra-22C caching controller and CDC hard disk enabled the unit to score well on PC Magazine Labs' DOS File Access tests.



Matrix 486-33 EISA, \$8,259.

The hard disk had a rated average access time of 16 milliseconds, and the controller came with 1MB of installed RAM, expandable to 4MB. The unit also performed well on processor and memory tests, but these results placed the Matrix 486-33 EISA more toward the middle of the pack.

The video board and monitor in the tested unit were excellent. The board was

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CIRCLE 147 ON READER SERVICE CARD



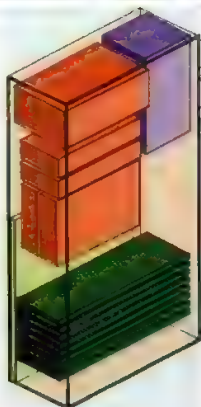


FACT FILE

Matrix 486-33 EISA

Matrix Digital Products Inc.,
1811 N.
Keystone St.,
Burbank, CA
91504; 800-227-
5723, 800-566-
8567 (in Calif.).
List Price: With
4MB RAM, 64K
processor RAM
cache, 1.2MB
floppy disk drive,
VGA video
adapter and
monochrome monitor, DOS 4.01, \$5,029; with
8MB RAM, 330MB hard disk, game port,
Super VGA color display subsystem, 1.2MB or
1.44MB floppy disk drive, \$8,199; with both
floppy disk drives, \$8,259.

In Short: The Matrix 486-33 EISA is an
average performer on both disk and processor
benchmark tests. The expansion options are
adequate for server environments but not
exceptional; there is room internally for four
half-height, one full-height, and two 3.5-inch
storage devices.



CIRCLE 549 ON READER SERVICE CARD

Orchid's highly regarded ProDesigner II, which uses a Tseng Laboratories chip set; it comes with 1MB of video RAM and supports a resolution of 1,024 by 768 with 256 colors. The Relisys RE-1520 monitor has a 15-inch-diagonal screen that is slightly larger than most of the other units included in this group. Its image was crisp, and its brightness, contrast, and power switches were within easy reach on the front of the unit.

Considering the primary use of the Matrix 486-33 EISA as a file server, many users will want to trade the high quality of the ProDesigner II or RE-1520 monitor for less-expensive components that sacrifice resolution or quality slightly. For them, Matrix offers a wide assortment of other video boards and monitors, including its own 800-by-600-resolution VGA board for only \$79.

The warranty provides the standard one year of coverage on parts and labor for all components except the Relisys monitor, which is covered for two years. Matrix includes one year of free on-site service from Nationwide Warranty Corp., and telephone support is toll-free.

Those who want a reliable EISA system but don't want to spend the \$15,000 or more for a Compaq Systempro, for example, will find the Matrix 486-33 EISA a solid and relatively inexpensive choice.

COMPUTERS

EISA 486/33s

The 486-33 EISA and the 486-25 EISA represent Matrix Digital Products' entire EISA line. The 25-MHz model has a suggested list price of \$595 less than the reviewed unit. Matrix also has a full line of ISA-based desktop systems running 286, 386SX, 386, and 486 processors. For the 486-33 EISA, the company charges a premium of about \$1,750 over its most powerful ISA system, a 486-25. Like several others, the Matrix 486-33 EISA strikes a balance between price and performance but does little to differentiate itself from the crowd.

NATIONAL MICRO SYSTEMS INC.

Flash 486-33 EISA

by Bruce Brown

Looking for a 33-MHz 486 EISA computer in a tower case for under seven grand? National Micro Systems' Flash 486-33 EISA can hold eight half-height drives and up to 64MB of RAM.

The Flash 486-33 EISA, priced at \$6,983, includes 8MB RAM, 256K of processor RAM cache, a 338MB Micropolis ESDI hard disk with an 18-millisecond rating and a 512K UltraStor U22C EISA controller, one 1.2MB floppy disk drive, and a video setup that includes an Orchid ProDesigner II Super VGA card with 512K of video RAM, and a TVM 14-inch multisync monitor.

For comparison, a similarly equipped ISA 33-MHz 486 from National Micro Systems with a 128K processor RAM cache costs about \$1,000 less, and a 33-MHz 386 ISA machine with a 64K cache costs about \$2,500 less than the Flash 486-33 EISA. National Micro Systems doesn't make 386 EISA machines. But the company has positioned this machine specifically for high-end users who are looking for capacity and capability down the road, and it assumes that this Flash system will be used mostly as a file server or a Unix workstation.

On our benchmark tests, the Flash showed fast video times, average disk times (in an admittedly very speedy group), and good Floating-Point Calculation test times. It also chalked up the slowest 80486 Instruction Mix and Conventional Memory test scores of the batch. Don't forget, however, that whatever the score variations, the computers that are in this group



Flash 486-33 EISA, \$6,983.

are all extremely quick machines.

National Micro Systems uses a motherboard manufactured by Advanced Integration Research, which incorporates a Phoenix ROM BIOS and discrete logic to control the processor RAM cache. The cache is an option, and you can choose a unit with no cache or a 256K cache using 30-nanosecond SRAM chips. There are 16 SIMM sockets on the motherboard, which can hold 256K, 1MB, or 4MB modules, for a potential maximum of 64MB RAM—not the largest capacity in our roundup, but ample for most uses.

The Flash's tower case provides excellent drive expansion capability as well, with room for eight half-height drives. If you intend to load up with memory and drives, you may wish to upgrade the standard 230-watt power supply; it comes with just four storage device connectors. The Flash provides eight 32-bit expansion slots, two of which are used by the disk controller card and the video card.

The company sells systems solely through mail order and includes an excellent 15-month warranty on parts and two years on labor. There is no provision for on-site service, even as an option. If you want service on this system, you have to pack it up and send it back to the Georgia facility; this is much less desirable than having someone come on-site, especially for such a large system. The company pays shipping both ways for system failures during the first 30 days and then pays only for return shipping through the balance of the warranty period. If you're going to buy a machine of this power, you

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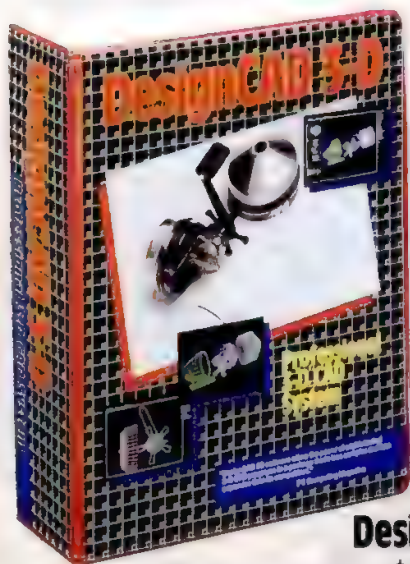
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CIRCLE 493 ON READER SERVICE CARD



33-MHZ 486-BASED EISA SYSTEMS: SUMMARY OF FEATURES

Products listed in alphabetical order by company

	Dataworld Data 486i EISA	Dyna Work Master 486 33 EISA	Fortron NetSet 486-33 EISA	Hi-Q 486/33 EISA	International Instrumentation Blue Max Monolith 486E/330CD	Matrix 486-33 EISA	National Micro Systems Flash 486-33 EISA
SOFTWARE							
DOS	4.01 (\$85)	None	4.01	4.01	4.01	4.01	4.01 (\$85)
OS/2	None	None	1.1 (\$299)	None	1.2 (\$399)	None	None
Disk caching software	None	None	Super PC-Kwik	None	None	None	None
Expanded memory manager	None	None	QEMM 5.0	None	EMS 5.1 (\$99)	None	None
Other software	Windows 3.0 (\$95)	None	Windows 3.0	Windows 3.0	SCO Unix, Xenix	QA Plus	None
MISCELLANEOUS							
Supports Waitek coprocessor	■	■	■	■	■	■	■
Power supply (watts)	396	375	375	230	230	250	230
Number of device connectors	7	5	6	5	5	6	4
Keyboard/case lock	Front/none	Side/front	Front/front	None/front	Front/front	Front/none	Front/none
Power-on/reset switch	Front/front	Back/none	Front/front	Front/front	Side/front	Front/front	Front/front
Warranty	1 year	1 year	1 year	1 year parts, 2 years labor	1 year	1 year	15 months parts, 2 years labor
Service	On-site	On-site	On-site	Phone service	Vendor, on-site	On-site	Vendor
FCC certification class	B	A	A	A	A	A	A
FCC Class B identification number	EJM486S403	N/A	N/A	N/A	N/A	N/A	N/A

■—Editors' Choice ■—Yes □—No
N/A—Not applicable: The product does not have this feature.



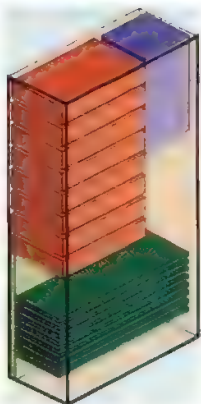
FACT FILE

Flash 486-33 EISA

National Micro
Systems Inc.,
2833 Peterson
Pl., Norcross, GA
30071; 800-642-
5649, 404-446-
0520.

List Price: With
4MB RAM, 256K
processor RAM
cache, 1.2MB
floppy disk drive,
Super VGA color
display
subsystem,
\$4,999; with 8MB RAM, 338MB hard disk,
DOS 4.01, \$6,983.

In Short: With room for eight drives and 64MB
of RAM, the Flash 486-33 EISA has plenty of
expansion options. This is a solidly built
system and sells for less than \$7,000 in our
standard configuration. It would receive a
higher recommendation if on-site service were
available.



CIRCLE 586 ON READER SERVICE CARD

probably won't want the aggravation or delay of having to ship the unit back to the vendor. The money you save over other systems may enable you to purchase a

third-party on-site service contract.

The Flash 486-33 EISA is a fine machine with excellent expansion capabilities at a good price. But the lack of on-site service, even as an option, keeps it from earning an unqualified recommendation.

NETIS TECHNOLOGY INC. Netis 486/33 EISA

by Bill O'Brien

Someone neglected to tell Netis Technology that there's a premium attached to EISA-bus computers. The Netis 486/33 EISA comes wrapped in a tower enclosure and features 8MB of RAM, a 200MB hard disk, two high-density floppy disk drives, a Super VGA display subsystem, and DOS 4.01. All you have to do is hand over \$5,939. While this is not an extensively equipped EISA machine capable of mega-network use, the pricing is low enough to match what you would pay for a relatively hefty 80386 package. If you can get by with 4MB of memory, a 100MB hard disk, and a monochrome VGA subsystem, you can even have 486 EISA speed and power for as little as \$4,846.



Netis 486/33 EISA, \$5,939.

Obviously nothing comes for nothing, and you might suspect at first that the Free Technology motherboard leaves something to be desired. It doesn't. From a performance standpoint, based on our processor and memory benchmark tests, the board is the functional equivalent of any other board in any other EISA machine reviewed in this issue. In fact, sev-

COMPUTERS

EISA 486/33s

Netis 486/33 EISA	Panther 486/33 EISA	PC Pros/Touche 5550T/486 EISA-33	Proteus 486/33 EISA	SAI 486/33 EISA	Tandon 486/33 EISA	PC Tangent Model 433e	Wedge 486/33 EISA	PC Zeos 486-33 EISA
4.01	4.01	3.31, 4.01	4.01	None	4.01	4.01	3.3, 4.01 (\$75)	4.01
None	1.3 (\$300)	None	None	None	1.2 (\$249)	1.2 (\$389)	None	None
None	None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None	None
None	None	None	Windows 3.0	SP Word	Windows 3.0	None	None	Windows 3.0
■	■	■	■	■	■	■	□	■
280	200	250	200	200	250	300	200	450
4	5	4	5	5	5	4	5	5
Front/none	None/front	Front/none	Front/none	None/front	Front/none	Front/none	Front/none	Front/none
Front/front	Front/front	Front/front	Front/front	Side/front	Front/front	Front/front	Front/front	Front/front
1 year	3 years	1 year	15 months	1 year parts, 3 years labor	1 year	1 year	1 year	1 year, 5 years keyboard
Phone service	On-site	Vendor, on-site	On-site	Vendor	On-site	On-site	Vendor	Phone service
A	A	B	A	A	B pending	A	A	A
N/A	N/A	IWB5550T48633E	N/A	N/A	DFK 7CST14205	N/A	N/A	N/A

ENDS

If Netis feels it should offer an EISA system at a low price, there's no reason you shouldn't take advantage of the opportunity.

eral of the other computers also contain Free Technology boards.

Where price does matter—slightly—is in the disk department. The 200MB Conner SCSI hard disk is 100MB to 150MB smaller than those in most of Netis's competitors reviewed here. The Bustek controller, although a SCSI bus-mastering device, lacks caching or buffering capabilities. Without that assistance, the disk is considerably slower than those \$9,000 to \$10,000 computers equipped

with caching devices. But for Netis's price, which saves you \$3,500 on the average, SMARTDRV.SYS (DOS's software disk-caching driver) will give you equivalent performance while snatching only a few thousand bytes of conventional memory and possibly a megabyte or two from extended memory. The loss would be significant in a network server but hardly noticeable in a machine destined for use as a workstation.

There is ample room for expansion inside the case; Netis provides six 32-bit EISA expansion slots and two 16-bit ISA slots on the motherboard. Six half-height drive bays will accommodate a variety of storage devices.

Netis has also cut some corners on the Super VGA display subsystem. Using a ZPVGA card with a Western Digital chip set is not as costly as an Orchid ProDesigner II or a Diamond SpeedStar video board, and here we find a corresponding performance penalty. The ZPVGA was disappointingly slow when tested on PC Magazine Labs' video tests. But to put that particular result into perspective, the ZPVGA scored no worse than many of the boards tested in ISA versions of the 80486. The speed dip is relative to the extremes afforded by the EISA environment and

not necessarily a drawback.

Perhaps most disappointing, the Netis machine is missing almost anything that even remotely resembles end-user docu-

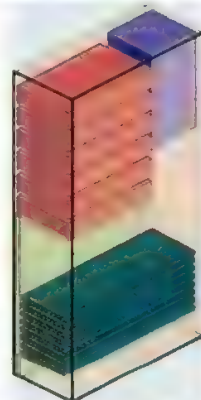


FACT FILE

Netis 486/33 EISA
Netis Technology Inc., 1544 Century Pointe Dr., Milpitas, CA 95035; 408-263-0368.

List Price: With 4MB RAM, 64K processor RAM cache, 100MB hard disk, 1.2MB and 1.44MB floppy disk drives, monochrome VGA display subsystem, DOS 3.3 or 4.01, \$4,846; with 8MB RAM, 200MB hard disk and noncached controller card, Super VGA color display subsystem, DOS 4.01, \$5,939.

In Short: Regardless of a slight downturn in disk performance, the Netis 486/33 EISA is much more affordable than most. A software cache (for single-user environments) would cure the disk woes without appreciably raising the price.



CIRCLE 601 ON READER SERVICE CARD



BENCHMARK TESTS: 33-MHz 486-BASED EISA SYSTEMS

A consistently strong performer across all tests, the Tangent Model 433e stands out in this group. With its Mylex motherboard, 128K processor RAM cache, Mylex caching hard disk controller, and Orchid video adapter, this system is equipped for top performance.

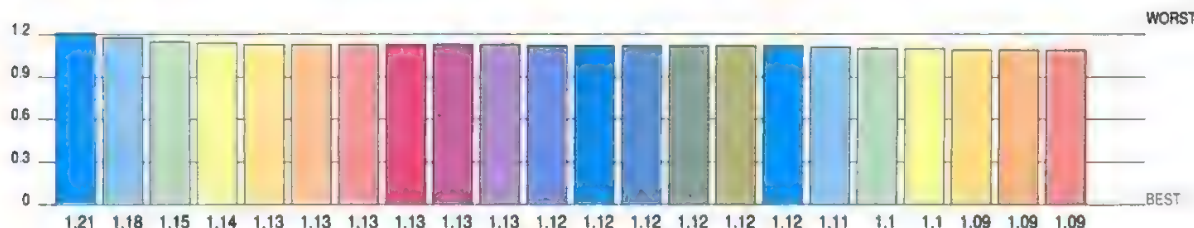
The **80486 Instruction Mix** benchmark test times a series of tasks specific to the 80486 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

The **Floating-Point Calculation Without Coprocessor** benchmark test sets up a floating-point emulation program in RAM and then exercises the processor and tests RAM access speeds during floating-point calculations.

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

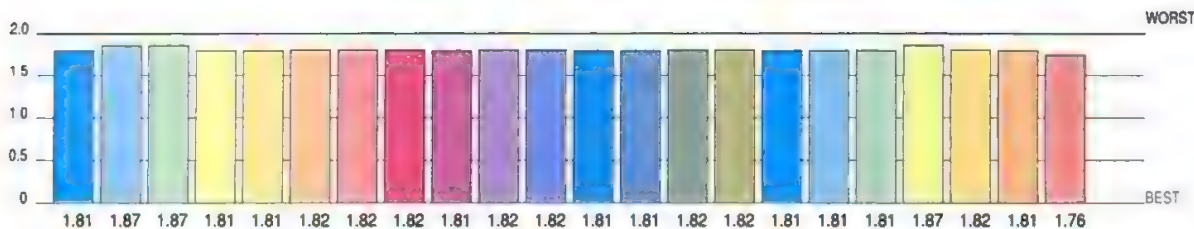
80486 Instruction Mix

Elapsed Time (seconds)



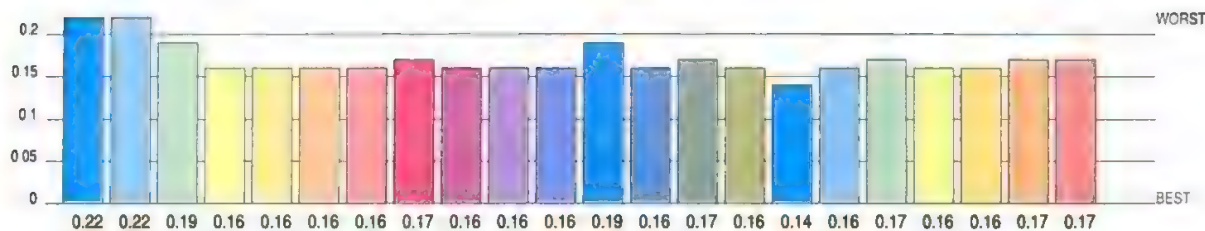
Floating-Point Calculation Without Coprocessor

Elapsed Time (seconds)



Conventional Memory

Elapsed Time (seconds)



In testing 22 486 33-MHz EISA systems, we used PC Magazine Labs' Hardware Performance Tests, Release 5.6, with video and system shadowing enabled wherever possible, and we left the buffers at their default values. We used no software disk caches when performing disk benchmark tests, and no RAM-resident programs were loaded for any tests. The SCSI hard disks were incompatible with our BIOS Disk Seek test; therefore the results for machines with SCSI hard disks are reported as N/A.

The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds, so take this into account when making purchasing decisions based primarily on speed.

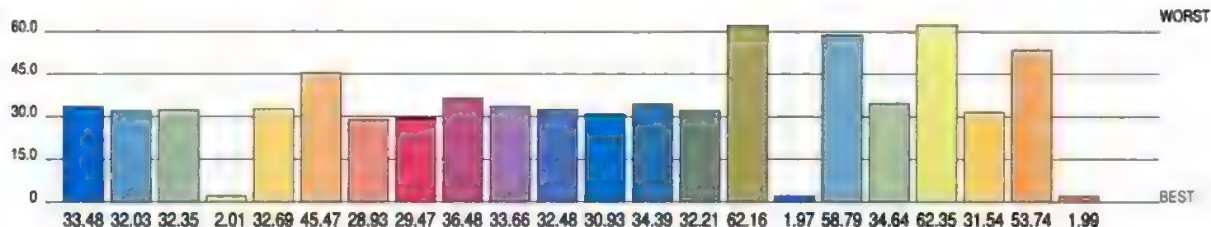
The DOS File Access (Small Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. The test is performed without software disk caching. Fast times are advantageous for programs that work with many short segments of data.

The DOS File Access (Large Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. This test minimizes the effect of small hardware caches on disk subsystem performance. It is performed without software disk caching. Fast times are advantageous when large files are loaded.

The BIOS Disk Seek benchmark test measures mechanical track-to-track disk drive access times. Fast times are helpful with programs such as databases, which often store and must later find data in many separate places on a drive.

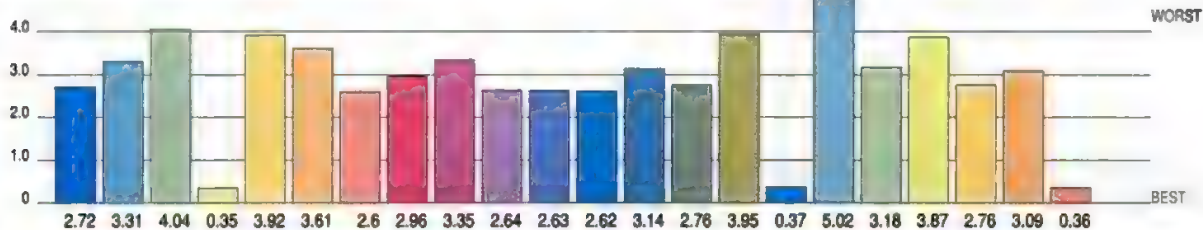
DOS File Access (Small Records)

Elapsed Time (seconds)



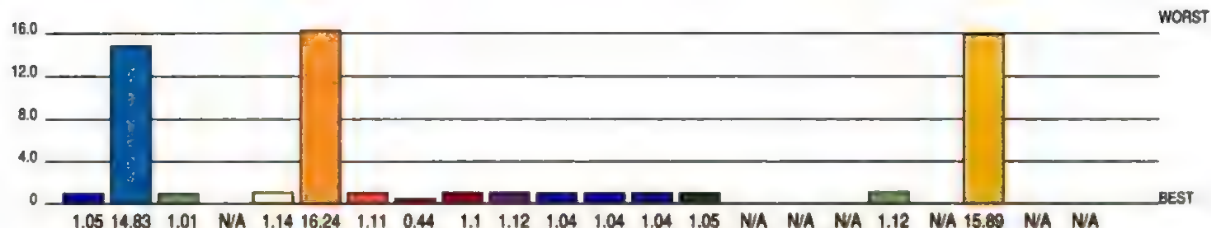
DOS File Access (Large Records)

Elapsed Time (seconds)



BIOS Disk Seek

Elapsed Time (milliseconds)



N/A—Not applicable: The SCSI hard disks in these systems were not compatible with PC Labs' BIOS Disk Seek test.

CONTINUES

Ironically, the difference bet and the second best ha



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ween the best color printer s little to do with color.

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you sent it. What's more, PhoenixPage's advanced screening techniques produce smoother shading and less grainy images. ColorPoint also supports industry standard downloadable typefaces such as Adobe Type 1 fonts—including hints.



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ColorPoint includes an Intel® 80960 embedded RISC-based processor that speeds up image-processing time. So you not only get superior 300 dpi quality, you get it as much as 60% faster.



SII 
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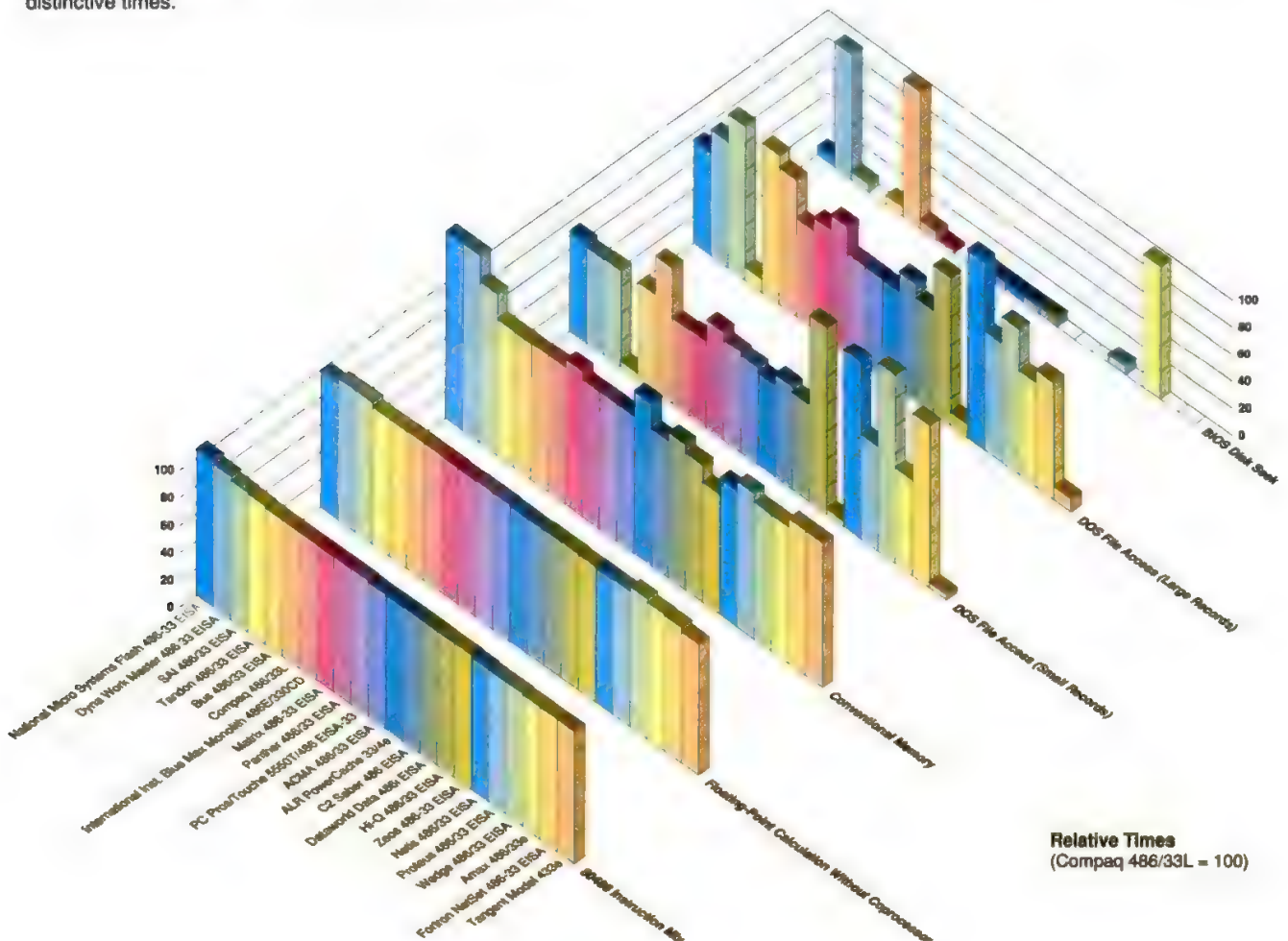
PROCESSOR, MEMORY, AND DISK BENCHMARK TESTS: COMPOSITE VIEW

Piling an external processor RAM cache onto 486 systems does not guarantee a performance advantage, as witness the times turned in on our processor and memory tests. The worst three performers—the Dyna Work Master 486 33 EISA, National Micro Systems Flash 486-33 EISA, and SAI 486/33 EISA—all came with 256K of discrete-logic processor RAM cache and AIR motherboards. On the other hand, the top two systems, the Tangent Model 433e and Zeos 486-33 EISA, both used only 128K of processor RAM cache on their Mylex motherboards.

The Zeos 486-33 EISA, Tangent Model 433e, and Tandon 486/33 EISA performed very well on our DOS File Access tests. All three have Seagate SCSI hard disks (the Zeos and Tangent disks being rated at 10.7 milliseconds and the Tandon at 14 ms.). The systems' phenomenal test results were due to their Mylex hard disk controllers. These controllers have a 4MB on-board cache and an on-board processor, and the latter gives these systems their distinctive times.

The poorest performers on the DOS File Access tests, the Wedge 486/33 EISA, Hi-Q 486/33 EISA, and Netis 486/33 EISA, each have a SCSI drive and Bustek controller, which has no cache. The Compaq 486/33L's slow 16.24-ms. score on the BIOS Disk Seek test also results from its lack of a hard disk controller, but the system does outperform Compaq's claimed average access time of 18 ms.

The Dyna Work Master 486 33 EISA and the Amax 486/33e also had BIOS Disk Seek times that fell far behind the others. Usually, with caching controllers, the system will not perform a seek and therefore will return an abnormally fast time. But both of these systems have an older version of the disk controller BIOS, which instructed the drive to do a seek; the resulting times reflect the claimed average access time for the hard disks.



Relative Times
(Compaq 486/33L = 100)

CONTINUES

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 - 207MB 15ms High Performance IDE Hard Drive
 - Sony 1304 VGA Monitor (1024 x 768 res) Non-Interlaced
 - Orchid 16-bit VGA Card with 1MB RAM
 - Teac 1.2 and 1.44MB Floppy Drives
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 - Free FED EX Replacement of Defective Components
 - FCC B Certification
- CIRCLE 533 ON READER SERVICE CARD

THE **TOUCHE** COMMITMENT TO QUALITY AND VALUE KEEPS GROWING!

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One example: Of 30 systems reviewed, **TOUCHE** ranked #1 in the small-record DOS access file test and #2 in the large DOS access file test for speed! To achieve this feat we relied on Maxtor and Ultrastor, two fantastic product partners.

Maxtor and Ultrastor are just two companies on a long list of companies we obtain high-quality components from to custom-build high-quality systems. AMI-Sony-Intel-Teac-Orchid-Keytronics-Colorado Memory Systems-CYRIX-SIEMENS-PC Power & Cooling-BOCA are all names you'll easily recognize. You'll never see us offer components from Ful-Manchul or other tongue-twisting companies you've never heard of before.

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BENCHMARK TESTS: 33-MHz 486-BASED EISA SYSTEMS

The **Direct to Screen** benchmark test indicates the speed of the video adapter memory. Good scores indicate that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen.

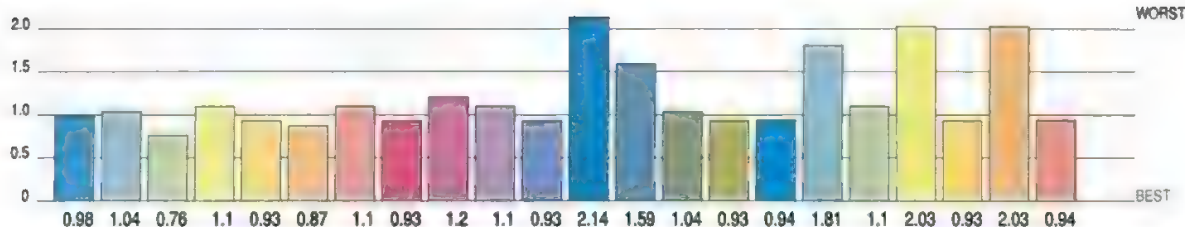
The **Video BIOS Routine Without Scrolling** benchmark test measures how quickly the BIOS on the video adapter writes text

data to the screen. Fast video writing helps with programs that show full or partial screens of data without scrolling the screen.

The **Video BIOS Routine with Scrolling** benchmark test measures how fast the video adapter can scroll the screen, moving the display up one line at a time. Good performance is helpful for scrolling through word processing or spreadsheet files.

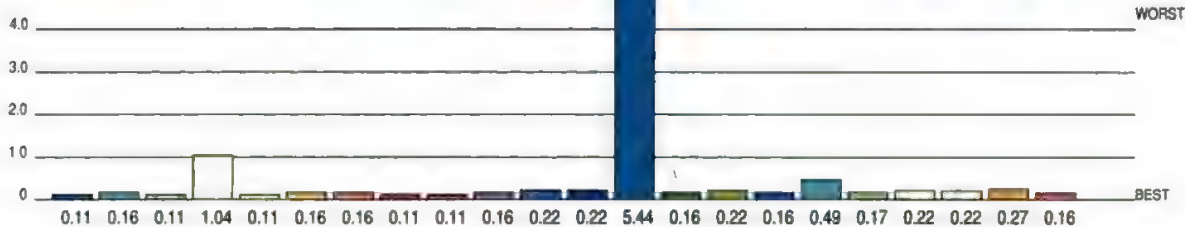
Direct to Screen

Elapsed Time (seconds)



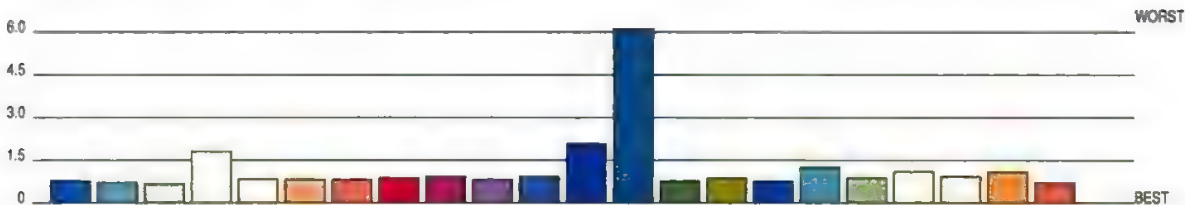
Video BIOS Routine Without Scrolling

Elapsed Time (seconds)



Video BIOS Routine with Scrolling

Elapsed Time (seconds)



National Micro Systems Flash 486-33 EISA
 Dyna Work Master 486-33 EISA
 SAI 486/33 EISA
 Tandon 486/33 EISA
 Bus 486/33 EISA
 Compaq 486/33
 International Inst. Blue Max Monolith 486/33
 Matrix 486-33 EISA
 Panther 486/33 EISA
 PC Pro/Touche 5550T/486 EISA-33
 ALR PowerCache 33/48
 C2 Saber 486 EISA
 Dataworld Data 486 EISA
 Hi-Q 486/33 EISA
 Zeos 486-33 EISA
 Neis 486/33 EISA
 Proteus 486/33 EISA
 Wedge 486/33 EISA
 Amix 486/33e
 Fortron NetSet 486-33 EISA
 Tangent Model 433e

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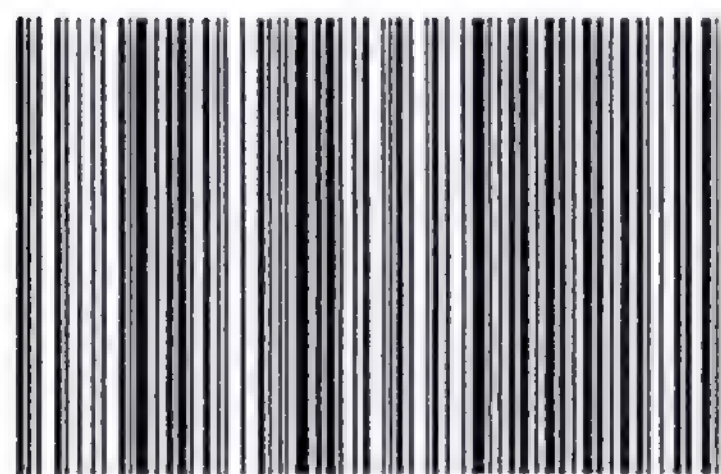
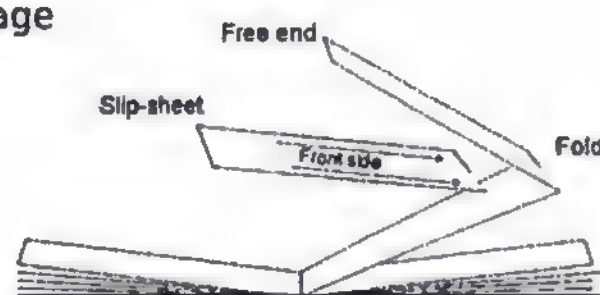
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Folded edge of the page

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



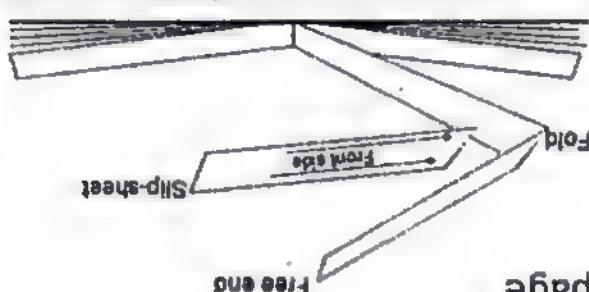
Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page
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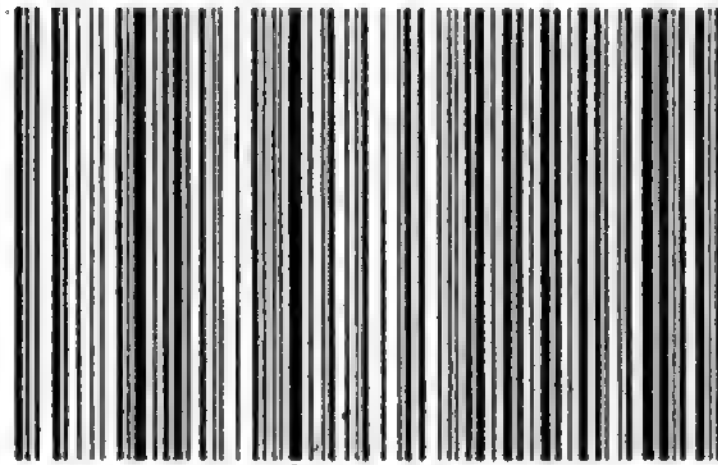
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4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-0018

Back

1. Follow instructions on the other side

YES, COMPLETE. \$1295

Editor's Choice! "ZEOS comes in a winner... The fastest SX tested... packing plenty of value... great expandability, quality parts and down to earth pricing... how could you go wrong?" *PC Magazine, Editor's Choice.*

How could we say it any better? You simply can't go wrong. The ZEOS 386SX is the best you can buy.

And right now, you can buy your own *complete* ZEOS 386SX 42MB hard drive system for only \$1295!

Nothing can touch it. The ZEOS 386SX gives you Guaranteed Value you simply can't get anywhere else. And ZEOS is America's premier '386 systems manufacturer. After all, *PC Magazine* selected ZEOS '386 systems "For Overall Excellence" above all others. But why do they call the ZEOS 386SX "a terrific choice"? Four key reasons:

Performance. Quality.



YOU WANT PERFORMANCE? THIS IS IT!

ZEOS has invested literally thousands of hours creating the world's finest 386SX.

And as *PC Magazine* said "it is the fastest SX tested," an awesome performer indeed!

This is no rehashed '286 design. It's a true '386 from the ground up. A Rock Solid Investment that runs circles around everything else out there.

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	Instruction Mix	Floating Point Calculation
ZEOS 386SX/16	3.99	6.98
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Compaq Deskpro 386S	4.48	9.67

QUALITY YOU CAN COUNT ON. ZEOS QUALITY.

Your ZEOS 386SX is designed and manufactured right in our own laboratories. We have used only the *very best* components available. From the power supply right thru to the video, every component is absolute top quality.

As an example. If you order a mono system you'll appreciate the fact that we use only genuine Hercules® brand monochrome graphics cards. They cost us more than double what others pay for their cheaper "Hercules compatible" cards. But Hercules® is quality. Quality you deserve.

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Even the floppy drive. Yours will be a genuine Teac®. They cost a lot more but you simply can't buy better. ZEOS systems. Quality from the ground up.

AN INCREDIBLE PRICE FOR AN INCREDIBLE MACHINE.

Incredible is the word! How can we build your

10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence."

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but five times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent."

Value: Excellent."

Personal Computing said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."



Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

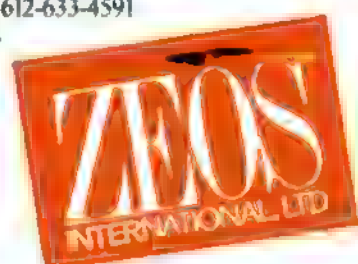
Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, *we Guarantee it!*

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as soon as your credit line is established!*

Please complete all appropriate sections, *providing at least two years residence and employment history*. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This Form Must Be Signed To Process Your Order.) All Financed Purchases Are Subject To Credit Approval. **If You Have Any Credit Questions, Please Call 800-421-8942 For Assistance. Thank You!**

A married person may apply for individual credit. I am applying for (please check appropriate box):

- ☐ **JOINT CREDIT** with another person. Complete entire application.
- ☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
- ☐ **INDIVIDUAL CREDIT.** Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS:
YOU MUST DISCLOSE YOUR MARITAL STATUS:

☐ married ☐ unmarried ☐ legally separated

A. YOUR PERSONAL INFORMATION

Name _____
Home Phone (_____) _____
Soc. Sec. No. _____ Date of Birth ____/____/____
Address _____ Apt. _____
City _____ State _____ Zip _____
Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____
Previous Address _____
City _____ State _____ Zip _____
Employer _____ Since? (Mo./Yr.) _____
Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____
Previous Employer _____ From - To _____
Occupation _____
Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.
Additional Monthly Income \$ _____ Source: _____
Name & Address of Nearest Relative Not Living With You _____
Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No
Savings Account ☐ Yes ☐ No

	Y/N	How Many?		Y/N	How Many?
Bank Loan	_____	_____	Dept. Store Charge Card	_____	_____
VISA	_____	_____	Credit Union Account	_____	_____
MasterCard	_____	_____	Other Major Charge Cards	_____	_____
Finance Company Loan	_____	_____			

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____
Soc. Sec. No. _____ Date of Birth ____/____/____
Address _____ Apt. _____
City _____ State _____ Zip _____
Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____
Joint Applicant's Employer _____ Since? (Mo./Yr.) _____
Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____
Date _____

Joint Applicant's Signature _____
Date _____

FOR MARRIED WISCONSIN APPLICANTS:
I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH—THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDITWORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW.

*Financing not available in Alaska, Hawaii or outside the continental U.S.

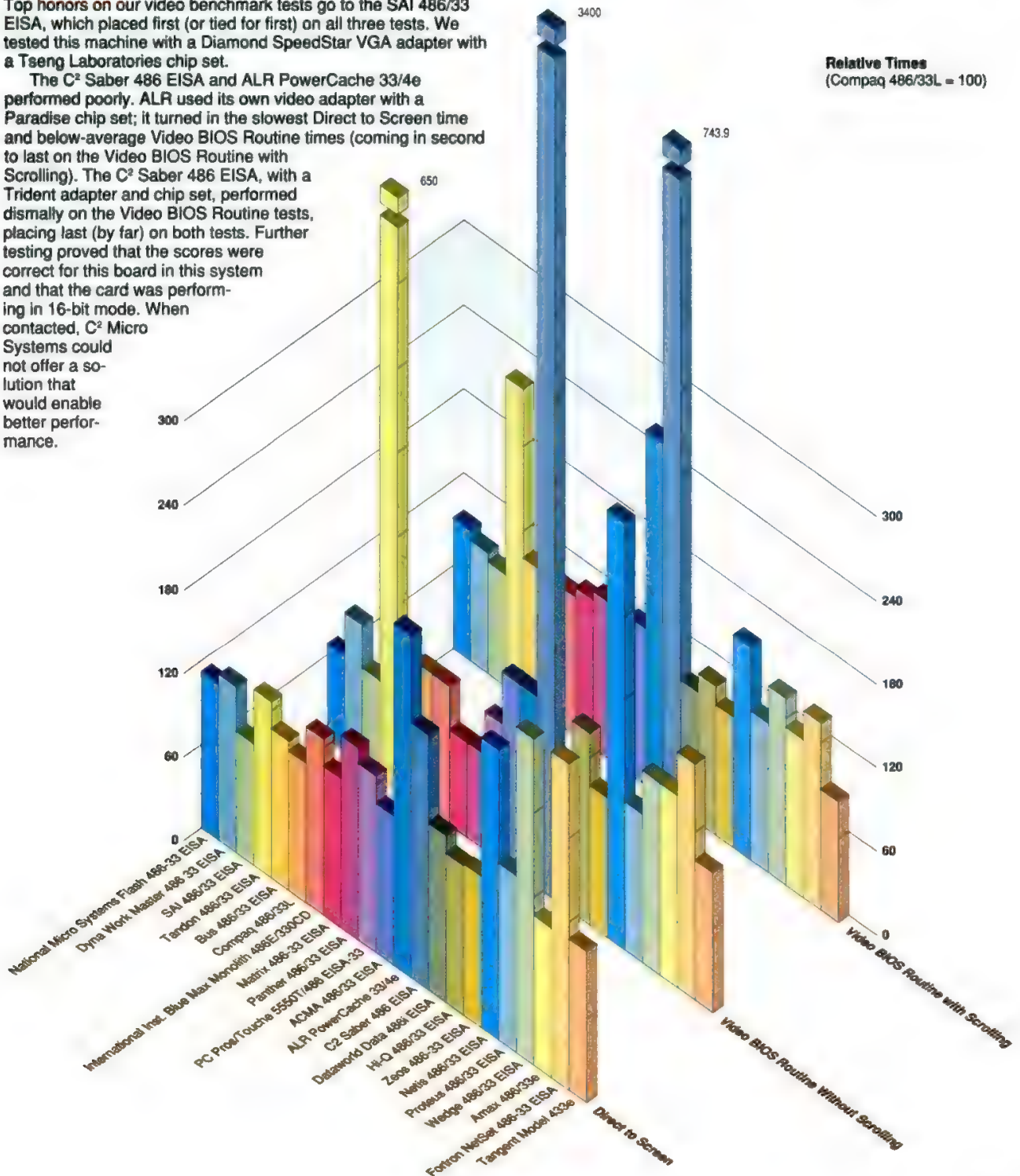


VIDEO BENCHMARK TESTS: COMPOSITE VIEW

Top honors on our video benchmark tests go to the SAI 486/33 EISA, which placed first (or tied for first) on all three tests. We tested this machine with a Diamond SpeedStar VGA adapter with a Tseng Laboratories chip set.

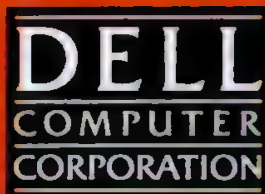
The C² Saber 486 EISA and ALR PowerCache 33/4e performed poorly. ALR used its own video adapter with a Paradise chip set; it turned in the slowest Direct to Screen time and below-average Video BIOS Routine times (coming in second to last on the Video BIOS Routine with Scrolling). The C² Saber 486 EISA, with a Trident adapter and chip set, performed dismally on the Video BIOS Routine tests, placing last (by far) on both tests. Further testing proved that the scores were correct for this board in this system and that the card was performing in 16-bit mode. When contacted, C² Micro Systems could not offer a solution that would enable better performance.

Relative Times
(Compaq 486/33L = 100)



ENDS

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Pages May Cause High Blood Pressure, Loss Of Sleep, And
Severe Depression.



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Getting more computer for less money is always a good idea. But with today's tight budgets, it's absolute genius.

Just check out the new Dell® 325P. It has a full 25 MHz 386™ DX CPU for better performance than the SX in the Compaq. There's an optional 32K RAM cache that can boost performance an additional 20%. And it's backed by a service package that's won an unprecedented 8 PC Week Corporate

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All for up to
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Finally, a poll with reliable information.

Remember those 8 Corporate Satisfaction Polls? Well one poll category we dominated is the one called "reliability"—maybe because Dell computers are designed, built and tested under the same roof. And nothing leaves the building until we're sure everything works like it's supposed to, when it's supposed to.

Then you get up to 30 days to use it.

If you aren't completely satisfied, send it back.



The Dell 325P 386 25 MHz[†] Lease: \$108/mo.**

THE NEW DELL SYSTEM® 325P 25 MHz 386.

Standard Features:

- Intel® 80386 microprocessor running at 25 MHz.
- Page mode interleaved memory architecture.
- Standard 1 MB of RAM,* optional 2 MB or 4 MB of RAM expandable to 16 MB on the system board.
- Integrated VGA controller with 1024 x 768 support.
- Integrated hard drive and diskette drive interface.
- Optional 32 KB SRAM cache.
- Socket for Intel 80387 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.

- 3 full-sized 16-bit AT expansion slots available.
 - High-performance IDE 40 MB, 80 MB, 100 MB, 190 MB, and 320 MB hard disk drives.
 - 1 parallel port, 2 serial ports, PS/2 compatible mouse port, all integrated.
 - 85 watt power supply.
 - 12-month On-Site Service Contract.
 - Optional i486 microprocessor upgrade card running at 33 MHz.
- 40 MB VGA Color Plus System \$2,499
- Price listed includes 1 MB of RAM.* 80, 100, 190 and 320 MB hard drive configurations also available.

[†]The Dell system includes VGA Color Plus Monitor, 80 MB hard drive, 2 MB RAM. The Compaq system includes VGA Color Monitor, 60 MB hard drive, 2 MB RAM. *Performance Enhancements: Within the first megabyte of memory 96 KB of memory is reserved for use by the system to enhance performance. Can be optionally disabled. All systems are photographed with optional extras. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. [†]Source: From the Compaq Computer Corporation price list effective October 15, 1990. **Payment based on 36-month, open-and-lease. [‡]Leasing arranged by Leasing Group, Inc. In Canada configurations and prices may vary. Dell and Dell System are registered trademarks of Dell Computer.

TOUGH ACT TO SWALLOW.



Compaq DeskPro 386s/20 386SX 20 MHz[®] Actual dealer prices may vary.

We'll return your money, no questions asked.

If something goes wrong, it won't wreck your day.

But just for the sake of argument, let's suppose something does go wrong with your Dell computer.

Just call the Dell toll-free technical hotline, we can solve 90% of all problems, often in 6 minutes or less.

If it can't be solved over the phone, a trained technician will come to your home or office the next business day with the solution in hand.[△]

But if you just can't wait, don't.

TechFax offers relief for insomniacs.

Say you're pulling an all-nighter and need help. Dell has pioneered a service called TechFax. Anytime, 24 hours a day, you can pick up the phone and call the Dell technical library on our automated TechFax line. Detailed information on your Dell system will be faxed right back to you automatically.

And all this coverage, including a full year of field service, comes at no additional cost.

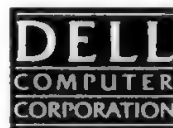
When your needs change, your computer can too.

Dell offers a number of ways to easily upgrade your system. Including a 33 MHz i486™ processor card to give you the hottest chip on the block. Which means you can get

a new computer without getting a new computer.

For sale, for lease,[◇] for less.

You can stretch your money even further with the most comprehensive credit, lease and lease-to-buy plans in the industry. So call us. Or talk to someone selling Compaqs. But be careful not to choke on the price.



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TURBOCHARGED.

Compaq has a peculiar proposition for you.

Even though their servers are configured similarly to Dell's, they want to charge you up to \$16,000 more for them.

That's bad enough in normal times, but with the tight budgets these days it's ridiculous.

The New Dell Drive Array gives performance a boost. With the Dell Drive Array, we've overcome the two big problems that plague most servers: Slow disk subsystem performance, and the difficulty of ensuring data integrity.

Let's tackle slow performance first:

The Dell Drive Array is based on the Intel® i960 RISC processor. And, depending on the application, can deliver twice the storage I/O performance of a stand alone ESDI drive.

Allowing more users to access the server more

quickly for
greater pro-
ductivity.



\$15,099

Lease: \$572/month**

The Dell® 433TE, 33 MHz i486™ Server

1 Array, 5 200 MB hard drives, 8 MB of RAM, 128 KB cache

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IN CANADA CALL 800-387-5752

As for ensuring data integrity, the Dell Drive Array uses parity checking techniques. So a single disk can guard all the data on up to 4 other disks.

What's more, the Dell Drive Array also uses a standard high performance SCSI software interface. Instead of Compaq's proprietary interface. Which means you can get up and running in just about every operating environment, without rewriting your device drivers.

THE DELL SYSTEM® 433TE 33 MHz i486 EISA AND THE DELL SYSTEM 425TE 25 MHz i486 EISA.

STANDARD FEATURES:

- i486 microprocessor running at 33 MHz (433TE) or 25 MHz (425TE) with 8 KB internal cache.
- 128 KB external cache (433TE).
- Standard 4 MB of RAM* expandable to 64 MB (eight internal SIMM sockets, each accepting a 1 MB, 2 MB, 4 MB or 8 MB SIMM, installable in matched pairs).
- Socket for WEITEK 4167 math coprocessor.
- 11 internal half-height drive bays.
- Eight 32-bit EISA expansion slots (six EISA master slots and two EISA slave slots).
- High-performance IDE (80 MB, 100 MB, 190 MB and 330 MB) and ESDI (330 MB, 650 MB) hard disk drives.
- SmartVu™ — Advanced systems diagnostic display.
- 12 month on-site service contract.

VGA Color Plus System with Array of 5 200 MB hard drives

433TE, 8 MB RAM* 33 MHz
425TE, 8 MB RAM* 25 MHz

\$15,099
\$13,199

The Dell Systems 433TE and 425TE are class A devices sold for use in commercial environments only. *Performance Enhancements. Within the first megabyte of memory 384 KB of memory is reserved for use by the system to enhance performance. The 433TE is photographed with optional extras. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. *Source: From Compaq October 15, 1990 price list. **Payment based on 36-month, open-end lease. Leasing arranged by Leasing Group, Inc. In Canada configurations and prices may vary. Dell and DELL SYSTEM are registered trademarks and SmartVu is a trademark of Dell Computer Corporation. Intel is a registered trademark and i486 is a trademark of Intel Corporation. UNIX is a registered trademark of AT&T in the U.S. and other countries. Other trademarks and trade names are used to identify the entities claiming

OVERCHARGED.



\$30,698*

Compaq SystemPro 486/33, 33 MHz i486 Server

1 Array, 4 210 MB hard drives, 8 MB of RAM, 512 KB cache

Actual dealer prices may vary.

Maintaining servers can be beyond Compaq dealers.

If a server goes down, your whole company can go down.

With Compaq, you have to trust the dealer who sold it to you to fix it. With Dell, you deal directly with us, the company that designs and manufactures your servers.

Which means you'll be working with a telephone support staff that solves 90% of all problems over the phone. Generally in 6 minutes or less.

And because Dell is an AT&T UNIX® source code licensee and validates compatibility with Novell and Banyan, you can be sure your technician knows quite a bit about networking too.

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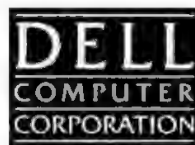
And all this coverage, including a full year of field service, comes at no additional cost to you. Pretty good for a service package that won eight PC Week Corporate Satisfaction Polls.

There's a lot more to know when you buy a server. From the first moment you call

Dell, and for as long as you own your system, we'll work with you and answer any questions—from service and technical issues or the wide variety of credit, lease or lease-to-buy plans available.◊

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CIRCLE 532 ON READER SERVICE CARD

COMPUTERS

EISA 486/33s

mentation. A cluster of technical pamphlets deal with the mechanics of the hardware you've purchased. Unfortunately, none of them jumps up to say "Open me first"—and this is not an optimal situation for novice users. If you run into a problem, you can call Netis for assistance. In case the problem is a malfunctioning system, your machine is covered for a full year on all parts and labor. Netis will ship replacement parts on request.

If Netis feels it should fly in the face of convention and offer an EISA system at a lower-than-average price, there's absolutely no reason you shouldn't take advantage of the opportunity. The Netis 486/33 EISA may not take our high-performance crown, but name-brand components and an industry-standard service policy make it a good bet.

PANTHER SYSTEMS

Panther 486/33 EISA

by Fredric Burke

Viewing a list price of \$7,699 for our standard configuration, readers can be forgiven for thinking that the Panther 486/33 EISA is missing something. It's not. Instead, Panther Systems has constructed a fully configured and easily expandable

home as a network server as it would be handling intensive CAD and DTP applications.

In an industry where warranties of more than a year are unusual, Panther laps the field twice with a three-year policy on parts and labor.

Even the basic configuration, at \$5,499, is well equipped. Where most manufacturers make users do without a hard disk and color VGA, Panther includes these items in the 486/33 EISA: 4MB of RAM, a 128K processor RAM cache, a 200MB hard disk, a choice of high-density floppy disk drives, and a VGA color display subsystem. All this came bundled in our test unit's rugged tower chassis, which was equipped with 8MB of RAM and also included a 329MB hard disk, both floppy disk drives, and an ATI Super VGA video adapter. Other options include 676MB and 1.2GB ESDI hard disks; a number of monitor options are also available.

Panther uses the AMI Enterprise motherboard and EISA BIOS. It also beefs up the caching capabilities of the 486/33 EISA by installing an additional 128K on the motherboard in the form of two 64K DIP chips. The motherboard also allows simultaneous use of a Weitek 4167 math coprocessor. The 486/33 EISA scored in the midrange on all of PC Magazine Labs' benchmark tests.

Further adding to the 486/33 EISA's attractiveness is the 96MB of RAM that can be installed. The motherboard will support a maximum of 32MB; to add the remaining 64MB, you have to spend \$300 for a proprietary 32-bit memory card. Here the fairly low price of the Panther 486/33 EISA works even further to its advantage: At \$70 per megabyte, memory can really be piled on without requiring

that you take out a second mortgage.

Seven 32-bit slots and a single 8-bit slot can be found on the motherboard, although the number of available slots is reduced to five after the machine is configured with a caching UltraStor hard disk controller, a video card, and I/O ports. A 329MB Seagate hard disk occupies one of the Panther's six half-height drive bays; the 1.2MB Fujitsu and 1.44MB Chinon floppy disk drives occupy two more.

Perhaps the feature that draws the greatest numbers of users to the 486/33 EISA will be Panther's service policies. In an industry where warranties of more than a year are unusual, Panther Systems laps the field twice by offering a three-year policy on parts and labor, with parts shipping arrangeable via a toll-free number. For an additional \$18 per year, Panther also offers an on-site service contract from General Electric.

In a small to medium-size networking environment, it would be difficult to find a machine that rivals the Panther 486/33 EISA. It is flexible, powerful, and well-built, and comes with a raft of network card and software options. For those who are looking to upgrade inside a tight budget, or who want a 486 for standalone applications, the Panther 486/33 EISA falls into that category of machines that make few compromises on their way to powerful, low-cost performance.



Panther 486/33 EISA, \$7,799.

machine. And it will deliver on the performance promise of the 80486. The Panther 486/33 EISA would be as much at

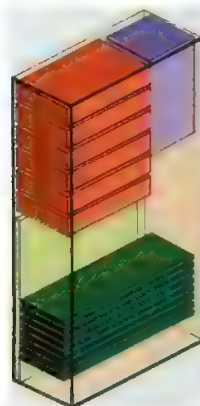


Panther 486/33 EISA

Panther Systems, 74 Hickory Ln., Roslyn Heights, NY 11577; 800-272-6843, 516-466-6108.

List Price: With 4MB RAM, 128K processor RAM cache, 200MB hard disk, 1.2MB or 1.44MB floppy disk drive, VGA color display subsystem, \$5,499; with 8MB RAM, 329MB hard disk, Super VGA color display subsystem, DOS 4.01, \$7,699; with both floppy disk drives, \$7,779.

In Short: A generous three-year warranty is one of the better qualities of the Panther 486/33 EISA, as is its low price. The system consists of a standard assortment of name-brand parts.



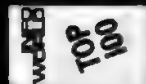
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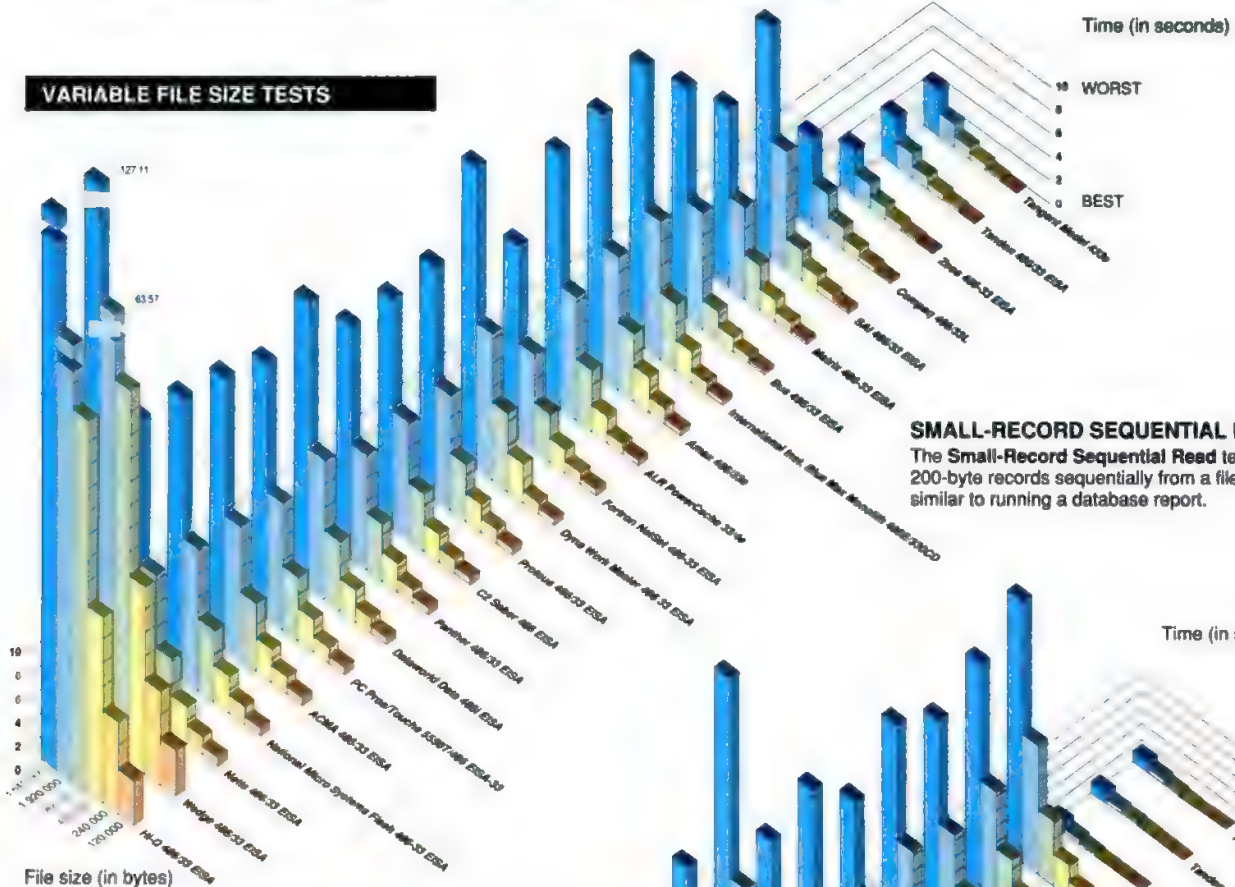


PERFORMANCE TESTS: 33-MHz 486-BASED EISA SYSTEMS

The cached Mylex disk controller in the Tandon, Tangent, and Zeos PCs contributed to the remarkable performance of all three. The Compaq's uncached Western

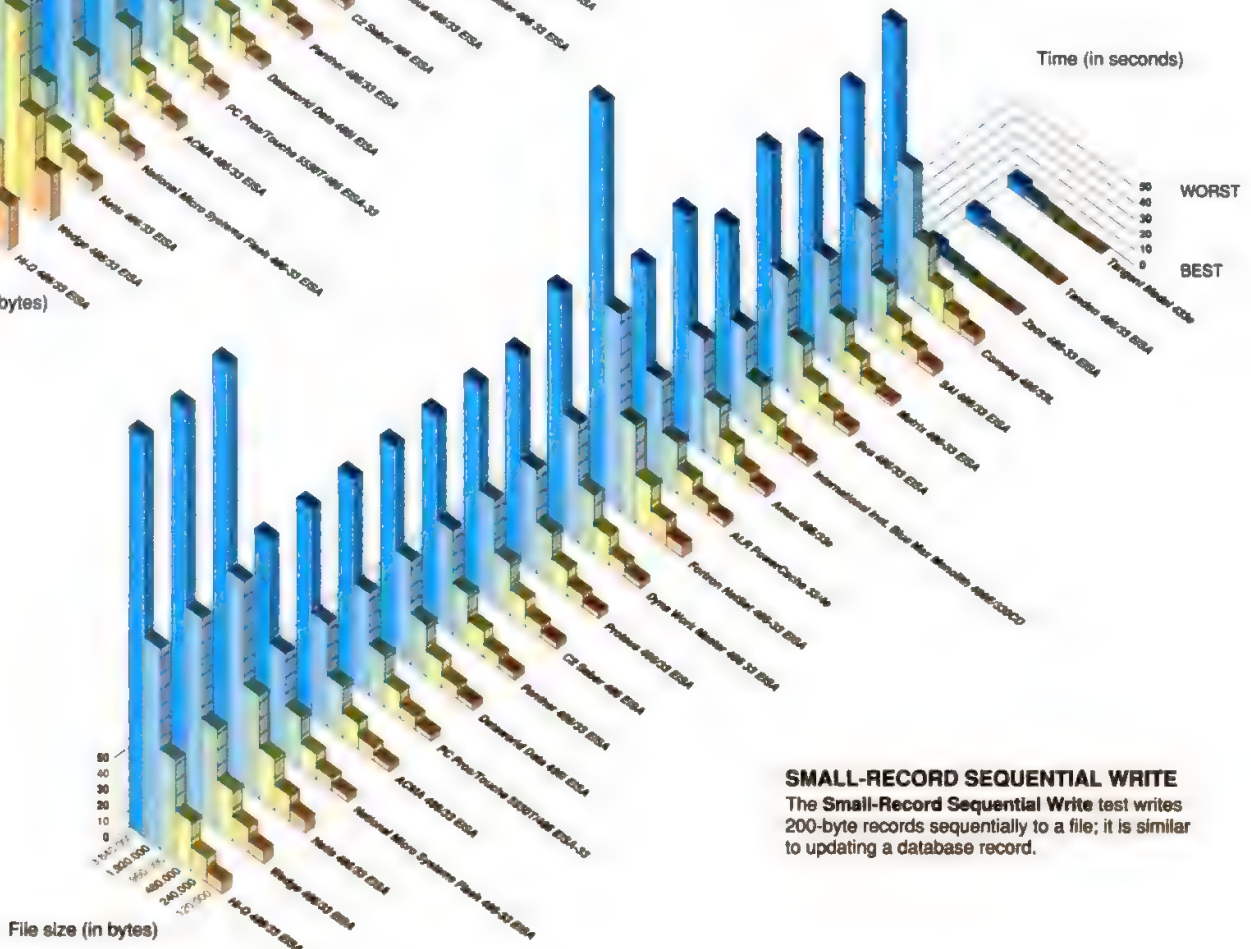
Digital disk controller couldn't compete with the cached systems on all tests, but it performed admirably compared with other uncached controllers.

VARIABLE FILE SIZE TESTS



SMALL-RECORD SEQUENTIAL READ

The Small-Record Sequential Read test reads 200-byte records sequentially from a file; this is similar to running a database report.

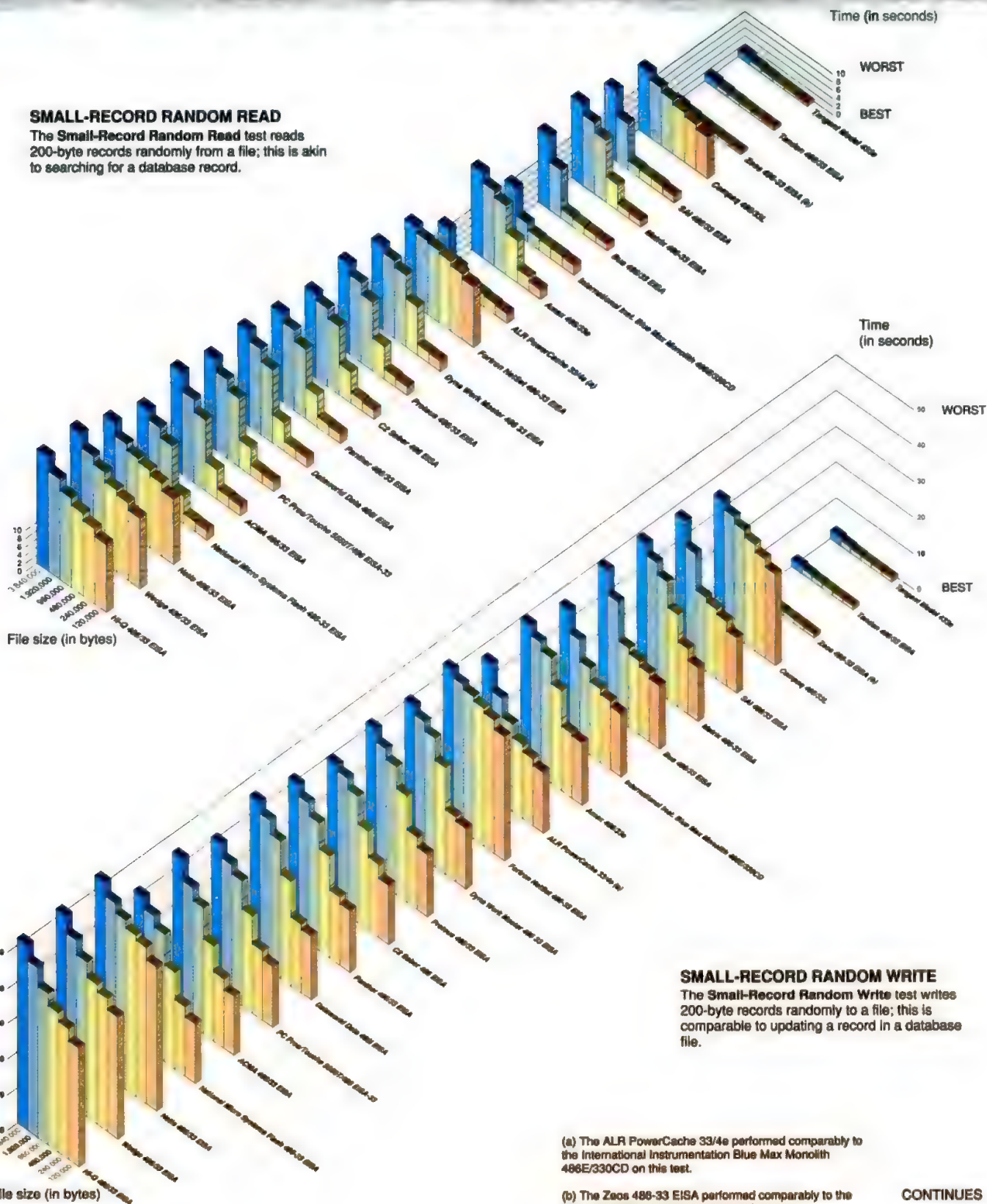


SMALL-RECORD SEQUENTIAL WRITE

The Small-Record Sequential Write test writes 200-byte records sequentially to a file; it is similar to updating a database record.

SMALL-RECORD RANDOM READ

The Small-Record Random Read test reads 200-byte records randomly from a file; this is akin to searching for a database record.

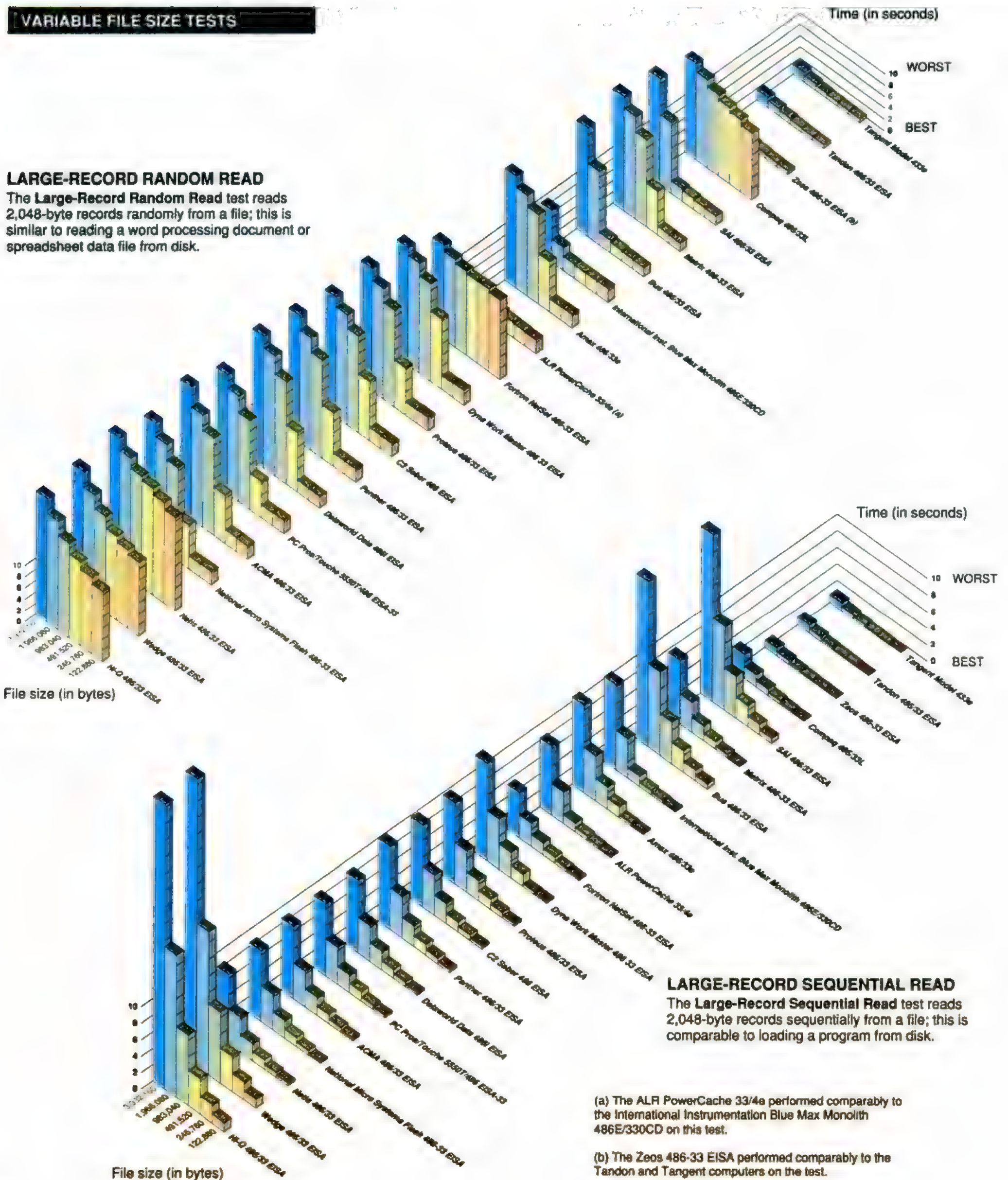


(a) The ALR PowerCache 33/4e performed comparably to the International Instrumentation Blue Max Monolith 486E/330CD on this test.

(b) The Zeos 486-33 EISA performed comparably to the Tandon and Tangent computers on the test.

CONTINUES

The Large-Record Random Read test reads 2,048-byte records randomly from a file; this is similar to reading a word processing document or spreadsheet data file from disk.



To determine the performance differences and similarities among the 22 systems we reviewed, we ran the Variable File Size tests from PC Magazine Labs' Hardware Performance Tests, Release 5.6. These tests demonstrate a controller's ability to handle small and large records over a range of file sizes.

We are reporting the results from the following six tests: Small-Record Sequential Read, Small-Record Random Read, Small-Record Sequential Write, Small-Record Random Write, Large-Record Sequential Read, and Large-Record Random Read. We are not reporting the results from the Small-Record File Create, Large-Record File Create, Large-Record Sequential Write, and Large-Record Random Write, as they provide no additional information.

For each test, we ran the controllers through seven different file sizes, from 120,000 bytes to 3,932,160 bytes. For each file size, the test was performed five times; an average of the five trials is reported on the graphs. These file sizes do not necessarily represent typical files that a DOS user would encounter. Instead, they show how the controllers performed with the cache when the file was smaller than the cache, and without the cache when the file was larger.

The relative flatness of the curves for those files smaller than the systems' caches indicates that in order to get the maximum benefit from caching, you should choose a cache size larger than any of your system's files.

Performance across all six tests clearly shows that the Mylex caching hard disk controller on the Tandon 486/33 EISA, Tangent Model 433e, and Zeos 486-33 EISA shatters the competition. Along with 4MB of RAM, this controller has a processor on-board, which enabled these systems to dominate the Variable File Size tests.

Although the ALR's UltraStor controller was also equipped with 4MB of RAM, it did not perform any better than the UltraStors with 512K. We ran our Variable File Size tests with deferred writes off, as UltraStor advised us to do, and evidently the caching algorithm prevents the full cache from being used effectively when writing to a file.

On some tests, a few noncached systems performed as well as or better than cached machines, but by and large the uncached systems faltered. The Wedge 486/33 EISA, Hi-Q 486/33 EISA, and Netis 486/33 EISA all came equipped with a noncached Bustek controller. These systems performed in the bottom tier on all tests, except for the Netis, which redeemed itself on the Large-Record Sequential Read and the Small-Record Sequential Read. While both the Hi-Q and Wedge systems have Maxtor 15-millisecond SCSI drives, the Netis's 15-ms. SCSI drive is from Conner.

The Compaq 486/33L performed very well, considering its uncached controller. The Western Digital card consistently outclassed the Bustek systems and turned in acceptable scores on most tests.

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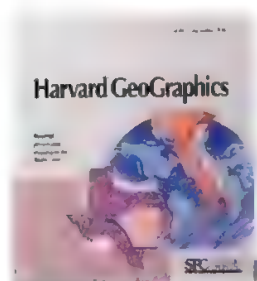
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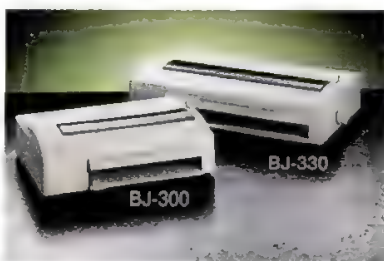
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CIRCLE 187 ON READER SERVICE CARD

COMPUTERS

EISA 486/33s

PC PROS/TOUCHE MICRO TECHNOLOGIES

Touche 5550T/486 EISA-33

by Bruce Brown

Low price, memory expansion, FCC Class B certification, and flexible service and support policies: If these factors count heavily in your buying decision, you just have to check out this machine. The Touche 5550T/486 EISA-33 has an attention-getting low price; it can handle up to 96MB of RAM, and it has several user-selectable service options.

Its price is \$6,299. That's right, \$6,299 for a fully configured system with 8MB RAM, a 347MB Maxtor hard disk (rated at 15 milliseconds) and UltraStor U22C EISA controller with a 512K cache, two floppy disk drives, a 1MB Orchid ProDesigner II Super VGA video card, and a 0.25-mm.-dot-pitch Sony 14-inch 1304-HG monitor. A second parallel port is an unusual but welcome addition to the norm. Obviously, no pennies were pinched in assembling the system, but if you're watching your money, you can afford to look even closer.

The Touche is one of the few FCC Class B computers reviewed in this article—a benefit that underscores the quality of the case. The unit's benchmark test scores didn't knock anyone's socks off, but "average" in this crowd is mighty fast indeed. All of the scores fall roughly in the middle of this extremely rapid pack.

The system uses an AMI motherboard with AMI ROM BIOS and discrete-logic circuitry for the 64K of processor RAM cache. If your application warrants, you can expand the cache size to 256K, although it's doubtful you'd see enough of a performance increase to justify the expenditure.

The motherboard has eight SIMM sockets that can hold up to 32MB RAM using 4MB modules. In case you need more memory—or you're using 1MB modules and want to add more without replacing what you already have—Touche sells a \$275 memory add-in board that fits into a proprietary 32-bit slot. Memory upgrades cost \$50 per megabyte.

The price delta between the 33-MHz 486 EISA machine and the 25-MHz variety is \$800; a 33-MHz 486 ISA machine is \$900 less than the EISA model. The price difference between an ISA 33-MHz 386



Touche Model 5550T/486 EISA-33, \$6,299.

system and an EISA 33-MHz 486 is about \$1,400.

PC Pros sells directly to end users via mail order, and although the prices are fixed, the company does offer 2 to 5 percent discounts to customers who pay for the systems in advance. It also provides a one-year parts-and-labor warranty and gives you the choice of on-site TRW service versus phone service with overnight

parts replacement (Federal Express) and toll-free support to walk you through installation. Unlike many companies, where the vendor makes the decision to supply on-site service, PC Pros lets the user decide which plan to use; this is a classy and reassuring touch. The company doesn't offer an unqualified guarantee, but it does guarantee compatibility and will refund your money if the system doesn't work with other hardware or software.

The price is surely right, and the flexible service plan is also commendable. As long as 96MB of RAM and six drives are enough to meet your needs (and they should be), the Touche 5550T/486 EISA-33 should be on your list of must-sees.

PROTEUS TECHNOLOGY CORP.

Proteus 486/33 EISA

by John R. Quain

The phrase "sticker shock" occasionally connotes something different in the PC marketplace: That's *all* it costs? Not only is the Proteus 486/33 EISA one of the smallest machines in this group, but at \$5,695 for our standard configuration (8MB of RAM, 128K RAM cache, 200MB hard disk, 1.2MB and 1.44MB floppy disk drives, crisp 1,280-by-1,024 Super VGA, DOS 4.01, and *Microsoft Windows 3.0*), it's also the rock-bottom cheapest. Considering that this mini-tower is built from name-brand components, this kind of sticker shock won't scare anyone.

With a pop-open front door that conceals everything except the LEDs, this little 486 EISA is aimed at users in the CAD and desktop publishing markets. Though EISA boards aren't yet able to take full advantage of the fast bus, our benchmark tests indicate that this bantamweight had no problem keeping up with the heavy hitters in our review group.

CAD applications tend to require a greater number of higher-math functions. The Proteus did well in this respect, turning in a Floating-Point Calculation test score of 1.8 seconds (though there weren't any machines in this group that could not as easily rise to the task on this test). For those with desktop publishing chores, disk test scores fell into the middle of the pack, as did the video scores.

The Proteus 486/33 EISA comes with a 200-watt power supply. The mini-tower design limits the drive bay area, which in turn might limit the system's use as a file



FACT FILE

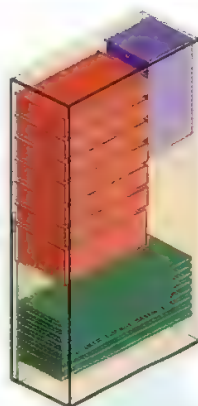
Touche 5550T/486 EISA-33

PC Pros/Touche Micro Technologies, 8205 S. Cass Ave., Danen, IL 60559; 800-999-9490, 708-810-1010.

List Price: Model 5520, with 4MB RAM, 64K processor RAM cache, 1.2MB and 1.44MB floppy disk drives, Super VGA color display

subsystem, two parallel and two serial ports, DOS 3.3 or 4.01, \$4,699; Model 5550T, with 8MB RAM, 347MB hard disk, \$6,299.

In Short: An inexpensive surprise, the Touche 5550T/486 EISA-33 provides terrific memory capacity (up to 96MB). The generous service policy includes on-site service, and Touche guarantees its system's compatibility with the purchaser's hardware and software.



CIRCLE 002 ON READER SERVICE CARD



FACT FILE

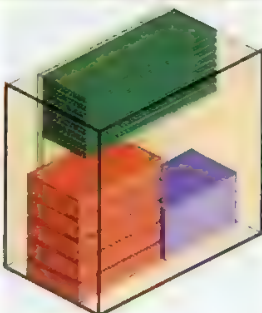
Proteus 486/33 EISA

Proteus Technology Corp., 377 Rte. 17 South, Hasbrouck Heights, NJ 07604; 800-878-6427, 201-288-2041.

List Price:

With 8MB RAM, 128K processor RAM cache, 1.2MB and 1.44MB floppy disk drives, Super VGA color display subsystem, DOS 4.01, Microsoft Windows 3.0, \$4,890; with 200MB hard disk, \$5,695.

In Short: Though it may not have all the flexibility its name implies, the Proteus 486/33 EISA mini-tower is very reasonably priced and should attract users looking for individual power for desktop publishing and CAD.



CIRCLE 606 ON READER SERVICE CARD

server: After installing two half-height floppy disk drives and a full-height hard disk, you'll be left with just one half-height drive bay. On the other hand, expansion board capacity is not restricted by the de-

COMPUTERS

EISA 486/33s

sign, with five full-size 32-bit slots still open after our requirements are fulfilled. If you're looking for an inexpensive file server, the real deal may be Proteus's optional 12-bay tower case with a 475-watt power supply. It's only \$400 more than the mini-tower. And you can always add a 600MB hard disk for \$1,200 over the base price.

Further qualifying the computer as a graphics workstation is the inclusion of the Tseng Laboratories 4000 Super VGA chip set—one of the best around. It will let you push image resolution up to 1,280 by 1,024. The monitor supplied with our tested unit, however, will not satisfy you in this regard. Proteus offers the 14-inch NEC MultiSync 3D as part of the system, but you'll probably want to consider either the Nanao (\$2,995) or Mitsubishi (\$2,200) 20-inch monitor options for desktop publishing or serious CAD work.

Proteus has also managed to cram a reputable AMI EISA motherboard into the tiny case. The company plans to release its own EISA board and—like other vendors—hopes to bundle in an EISA video



Proteus 486/33 EISA, \$5,695.

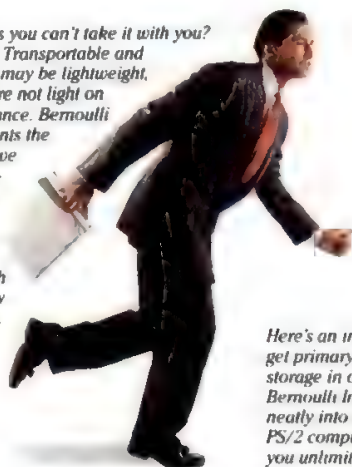
adapter soon.

The AMI board makes use of a 128K external processor RAM cache, which Proteus claims has a 98 percent average hit rate. In our tests, though, it didn't exactly set the benches on fire, demonstrating the marginal gain that external caches offer



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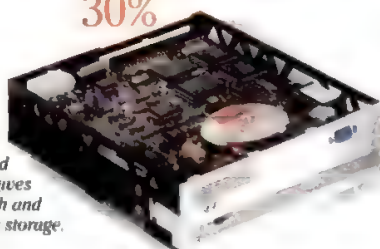
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COMPUTERS

EISA 486/33s

over the 80486 chip's internal 8K.

Even with the cramped quarters, the 1-by-9Mb 80-nanosecond SIMM memory was literally a snap to install and change by hand. Each megabyte over the standard 8MB is a mere \$79, with a limit of 32MB on the motherboard and an additional 64MB available via an expansion card.

The Proteus package also included two minor disappointments: the unresponsive Focus keyboard and sticky Agiler mouse. But at these prices, it shouldn't be a hardship to replace them.

The 486/33 EISA is Proteus's top machine, priced about \$800 more than its 486 ISA unit. With a 15-month on-site warranty from TRW, the Proteus 486/33 EISA is a good choice for the power-hungry professional with limited desk space.

SAI SYSTEMS LABORATORIES INC.

SAI 486/33 EISA

by Kellyn S. Betts

In this mature personal computer market, mail-order vendors can effectively reduce the price levels for even the most expen-

sive classes of machines. Every once in a while, a vendor succeeds in creating a true value: a high-quality machine at a really low price.

SAI Systems Laboratories seems to have hit on that combination. Its SAI 486/33 EISA costs only \$6,316 equipped with 8MB of RAM, a 150MB ESDI or 200MB IDE hard disk, a 1.2MB or 1.44MB floppy disk drive, and an impressive video subsystem that comprises a Diamond SpeedStar video adapter and a NEC MultiSync 3D monitor.

The SAI 486/33 EISA performed quite well on our tests. For starters, in terms of video performance, this system surpassed all the other 33-MHz 486 EISA machines. The Diamond SpeedStar adapter excelled, plugged into a slot on the Advanced Integration Research motherboard. Many users of graphics-intensive programs may be waiting for 32-bit EISA video boards, but the present subsystem is already a good choice for CAD applications.

The performance of the hard disk subsystem in the machine we tested was not as stellar but was nonetheless impressive.

The 150MB ESDI Imprimis hard disk and Data Technology controller performed within the norm on our new Variable File Size test, which measures the merits of cache controllers. The 1MB disk cache stood the SAI 486/33 EISA in good stead, and its performance indicates that it would



SAI 486/33 EISA, \$6,395.

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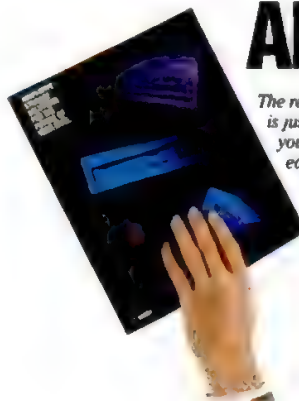


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- Info World Buyers Assurance Seal



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I-MEGA
The Makers of Bernoulli

CIRCLE 378 ON READER SERVICE CARD

do well as a network server. On the traditional DOS File Access tests, however, the performance was closer to the midrange within a group that takes full advantage of

FACT FILE

SAI 486/33 EISA

SAI Systems Laboratories Inc., 911 Bridgeport Ave., Shelton, CT 06484; 800-331-0488, 800-248-3082, 203-929-0790.

List Price: With 4MB RAM, 256K processor RAM cache, 1.2MB or 1.44MB floppy disk drive, Hercules monochrome display subsystem, \$3,795; with 8MB RAM, 150MB or 200MB hard disk, Super VGA video adapter, NEC MultiSync 3D monitor, DOS 3.3 or 4.01, mouse, \$6,316; with both floppy disk drives, \$6,395.

In Short: The price is right on the SAI 486/33 EISA. A fast video subsystem makes this machine a good choice for CAD applications. Because the chassis is limited to five drive bays, you might think twice about using this system as a huge file server.

CIRCLE 607 ON READER SERVICE CARD

EISA's bus-mastering capabilities.

To be fair to its competitors, we should point out that the machine's small hard disk is one of the factors that helps keep the system price down. Because of time limitations, SAI sent us a machine with a 150MB hard disk, though it also offers a 200MB IDE disk for the same price. The only other two disk options available from the company both add a great deal to its cost: A 300MB ESDI disk (the size included in many of the other machines we reviewed) would bring the cost of this system up to \$6,895.

The machine's performance was not exactly superlative on our processor tests, where differences are measured in hundredths of a second. On these tests, the SAI 486/33 EISA's scores were average or below, despite its 256K of processor RAM cache.

SAI's EISA computer is housed in an AT-style case, and the relatively small space is used well. Two of the machine's eight 32-bit bus-mastering slots are lost to the floppy/hard disk controller and the video board, but six is a fair number of open

slots for a network server. But having only five half-height drives could limit its use in that role.

Adding to this machine's general attractiveness is its generous service and support policy. The company offers a 30-day money-back guarantee (exclusive of shipping costs). The parts warranty is for one year, but labor is covered for an impressive three years. SAI will cross-ship a part as you request it, but you have to pay to ship the problem part back. (During the first 60 days, all shipping is paid by SAI.)

For comparison, it may be useful to consider what SAI would charge for this machine with a 300MB hard disk. Even at \$6,316, the SAI 486/33 EISA compares quite favorably with its peers, and it could be the machine of choice for many networking and graphics applications.

TANDON CORP.

Tandon 486/33 EISA

by Fredric Burke

Tandon, a long-time force in the European market, has refocused its efforts in the United States with its 486/33 EISA. Tan-

Oh, what a twis

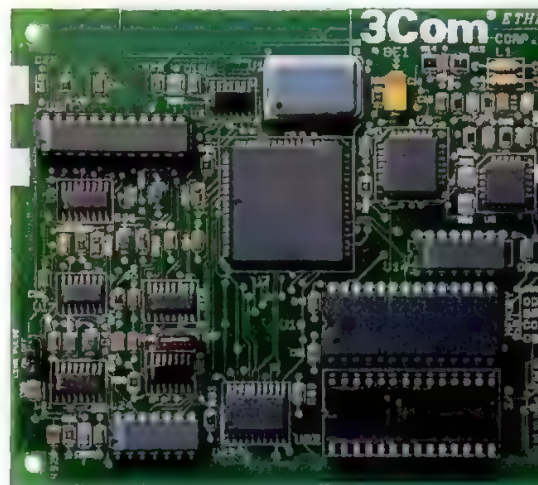
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COMPUTERS

EISA 486/33s



Tandon 486/33 EISA, \$10,047.

don emphasizes that it designed this machine as a 486 from the outset, instead of reinventing the wheel with a modified 80386-based motherboard. Thus, the 486/33 EISA has been optimized for its tasks as a file server or CAD (Computer Aided Design) platform.

Our tested unit cost \$10,047. Although in the basic configuration the Tandon 486/33EISA is competitively priced at \$7,299 for the desktop model and \$7,699 for the tower, it does without the tested unit's 8MB of RAM, 330MB Seagate SCSI hard disk, and Super VGA color display subsystem, making do instead with 4MB of RAM, a 200MB IDE hard disk, and monochrome VGA.

Given Tandon's subsidiary role as an OEM supplier, it is not surprising that the company makes its own motherboard, BIOS, and both 1.2MB and 1.44MB floppy disk drives. The motherboard is rated at 33 MHz, the bus at 8 MHz. In addition to the 8K cache that is native to the 486 chip, Tandon adds an external Mylex 64K cache, made up of 15-nanosecond DIP chips. Also featured is Tandon's exclusive PowerPoster, a burst-mode write buffer that sends four words per clock cycle (instead of the commonly found single word). The motherboard also supports simultaneous use of a Weitek 4167 math coprocessor.

The Tandon 486/33 EISA is clearly de-



FACT FILE

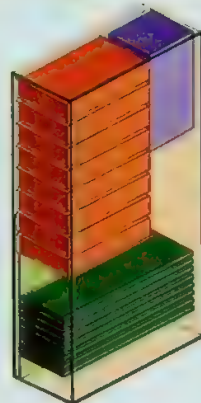
Tandon 486/33 EISA

Tandon Corp.,
405 Science Dr.,
Moorpark, CA
93021; 800-800-8850.

List Price: With 4MB RAM, 64K processor RAM cache, 200MB hard disk, 1.2MB and 1.44MB floppy disk drives, Super VGA video adapter,

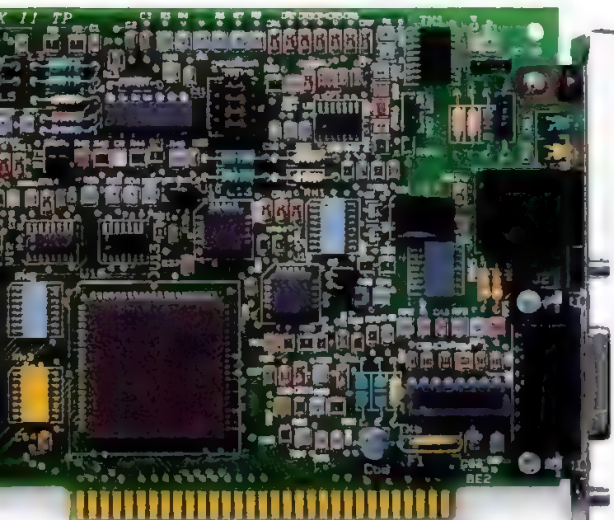
monochrome VGA monitor, DOS 4.01, \$7,299; with tower case, \$7,699; with 8MB RAM, 330MB hard disk and caching controller, both floppy disk drives, Super VGA color display subsystem, DOS 4.01, \$10,047.

In Short: The effort that went into this system's design is apparent. The Tandon 486/33 EISA has superior disk access, though its video test scores are somewhat disappointing. The price is quite high in light of the direct-distribution policy, but your money will buy you a well-thought-out computer.



CIRCLE 608 ON READER SERVICE CARD

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CIRCLE 293 ON READER SERVICE CARD

COMPUTERS

EISA 486/33s

signed for heavy use. The chassis is ruggedly constructed, and its generous expansion capabilities are easily accessed. The system's eight 32-bit slots and single 8-bit slot are fairly standard for machines in this class. As many as eight half-height devices can fit in the 486/33—again, a fairly standard, ample number for machines in this category.

Memory-intensive applications are well provided for. In addition to the large number of drive bays available, you can expand up to 64MB through a combination of 1MB and 4MB 80-ns. SIMMs and Tandon's proprietary memory board.

The Tandon 486/33 EISA represents good value for the money. It excelled on our disk benchmark tests, thanks to the 4MB cache installed on the Mylex disk controller. Video scores, meanwhile, showed weakness.

Tandon's standard parts-and-labor warranty lasts a year, and TRW provides on-site service. The 486/33 is extremely robust and strongly supported. As part of the new wave of 486 EISA machines that are coming to market, the Tandon 486/33 EISA is a powerful contender and worthy of consideration.

TANGENT COMPUTER INC.

Tangent Model 433e

by Bill O'Brien

Tangent Computer's foray into the realm of the EISA bus is represented by an investment-quality machine. The \$9,690 Tangent Model 433e unit we tested satisfies *PC Magazine's* requested configuration with 8MB of RAM, 329MB hard disk, Super VGA display subsystem, and DOS 4.01. The basic configuration sells for \$4,790, but it's devoid of hard disk and color video and has but a single megabyte of RAM.

Like most of the EISA computer vendors, Tangent has given in to the edifice complex: it packs its computer in a tower enclosure with six half-height drive bays and a hefty 300-watt power supply. The Mylex motherboard uses an Intel EISA chip set and a combination of peripheral controller and BIOS chips from Phoenix and Mylex. The eight 32-bit EISA slots are a big plus for the machine, but the motherboard RAM capacity poses a dilemma.

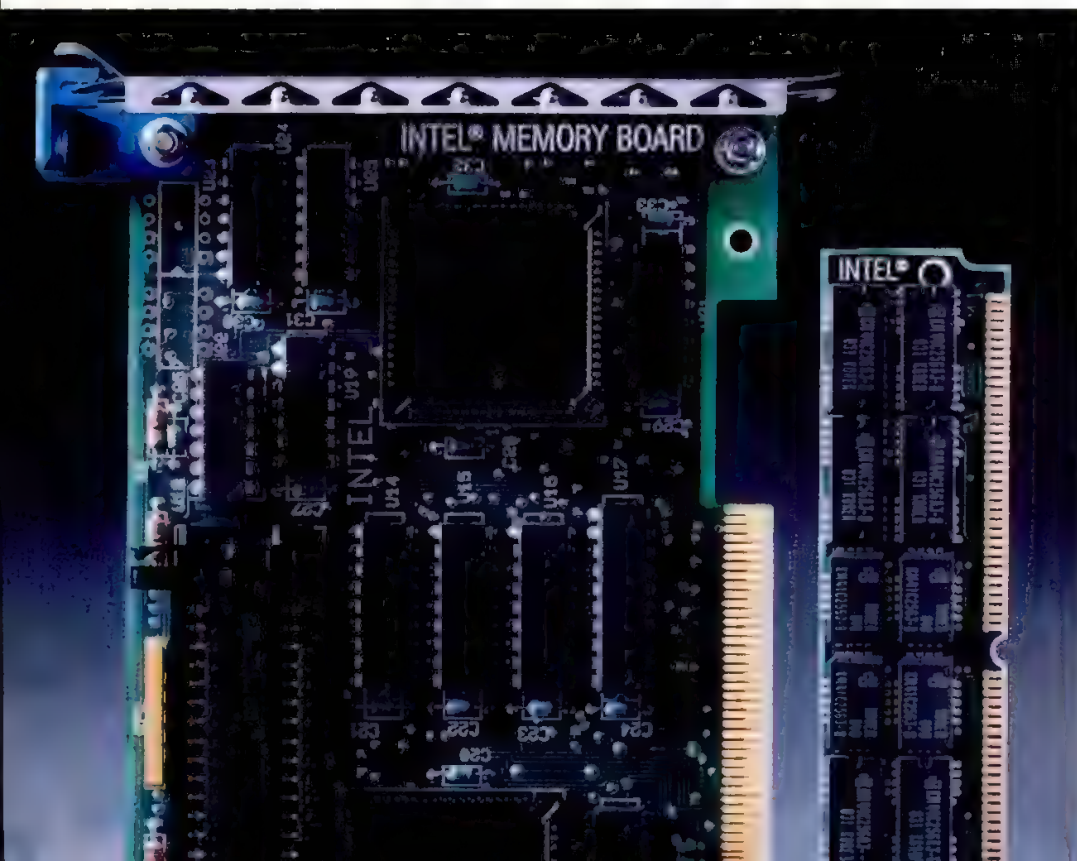


Tangent Model 433e. \$9,690.

Eight SIMM slots provide room for the 8MB of memory installed in the unit, but at that point the motherboard is filled.

There are only two possibilities for expansion beyond 8MB. You can choose EISA-slot RAM cards (remember that carded RAM always causes performance

Power.



penalties), or for the more attractive option, performancewise, remove the 1MB SIMMs and replace them with 4MB units.

COMPUTERS EISA 486/33s

FACT FILE EDITORS' CHOICE

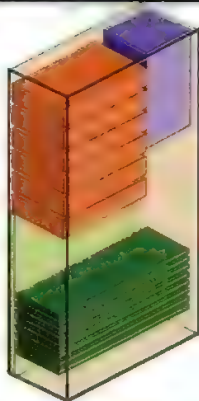
Tangent Model 433e

Tangent Computer Inc.,
197 Airport Blvd.,
Burlingame, CA
94010; 800-223-
6677, 415-342-
9388.

List Price: With
1MB RAM, 128K
processor RAM
cache, 1.2MB or
1.44MB floppy
disk drive,
Hercules
monochrome
monitor, \$4,790;

with 8MB RAM, 329MB hard disk, Super VGA
color display subsystem, DOS 4.01, \$9,690.

In Short: Top-notch components fill the
Tangent Model 433e's chassis. One possible
shortcoming is the motherboard's limit of eight
SIMM sockets; otherwise the system has
decent room for growth.



This will cost you, though. With 1MB SIMMs selling for an average of \$100, you'd be tossing out \$800 in components (barring any possibility of a trade-in or a buy-back plan). After that, you'd need to add on the cost of the expensive and scarce 4MB SIMMs. The cost of migrating from 8MB to 32MB could top \$3,000.

This means that you must plan your purchasing decisions very carefully. Tangent claims that current EISA sales are brisk in the CAD/CAM market, which is awaiting the arrival of any of several EISA graphic cards. You'll need to make some hard decisions regarding the viability of your graphics application within a given memory environment. If there's a chance that your work will exceed the room offered by an 8MB system, ordering 4MB SIMMs initially will save money in the long run. Likewise, if you're intent on running the Model 433e as a Unix server, your most economic course of action will be to define the maximum system load and fit the RAM for it, rather than to go with a minimum amount and expand later.

The remaining system components, the

SCSI hard disk (with a Mylex 4MB caching bus-mastering controller) and the Orchid ProDesigner II VGA card, are both top-notch inclusions with outstanding performance on PC Magazine Labs' tests. Tangent backs its Model 433e with a 30-day return policy and a one-year on-site service policy handled by TRW. The motherboard is covered for an additional year on labor, and barring a complete meltdown of the board, labor will be the most expensive part of the repair.

The price of Tangent's Model 433e is high relative to ISA 486 costs, but it is on a par with many of the other computers in this review. Tangent has backed the system with an excellent service policy, and in a business environment, reliability is often the most important consideration.

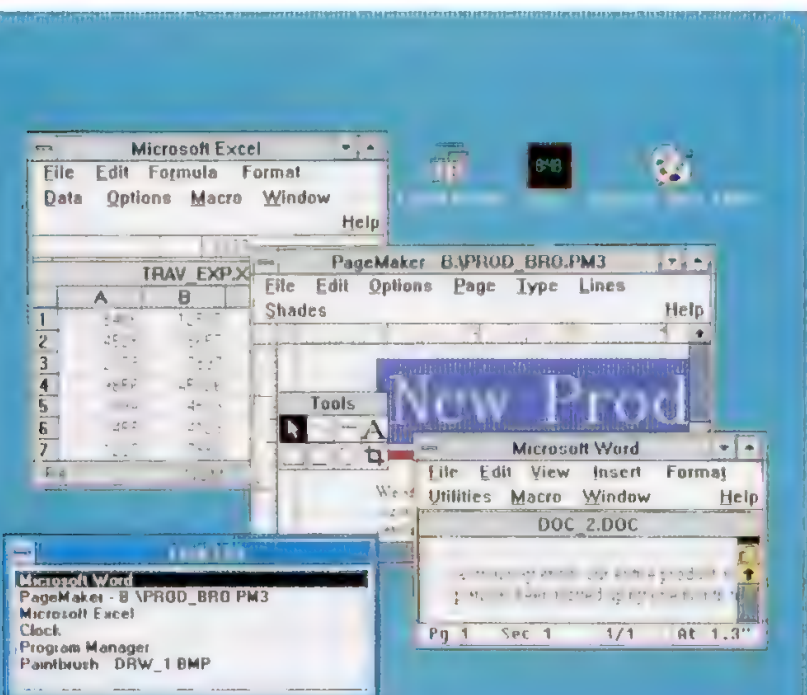
WEDGE TECHNOLOGY INC.

Wedge 486/33 EISA

by Fredric Burke

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50 SHEET CASSETTE TRAY	YES	NO	NO
PRINTS MULTI- PART FORMS	YES	NO	NO
BUILT-IN CUT-SHEET FEEDER	YES	NO	NO
WORKS UNDER YOUR LAPTOP	YES	NO	NO
UP TO 100 PAGES ON A SINGLE CHARGE	YES	NO	NO
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Wedge 486/33 EISA, \$6,675.

pherals, and an attention to detail that may not be found in lesser machines. Wedge Technology's crown jewel, the Wedge 486/33 EISA, has a very reasonable standard-configuration price of \$6,675, but it would benefit from even more attention. Still, the company deserves credit for

COMPUTERS

EISA 486/33s

packaging this system in a small-footprint case.

Wedge's basic configuration of the 486/33 EISA forgoes such essentials as a hard disk and color monitor. AT \$5,037, users will get 2MB of RAM, a 1.2MB or 1.44MB floppy disk drive, and a monochrome monitor. It's hard to believe that many will go for this model, simply because it is incomplete. Yet it does provide a sound foundation for expansion.

Wedge builds its own motherboard for the 486/33 EISA, as well as the chip set. The machine uses an Award BIOS, which can be shadowed for both video and system modes. In addition to the 8K cache inherent in the 80486 chip, Wedge has fitted an external Intel 128K cache to the motherboard.

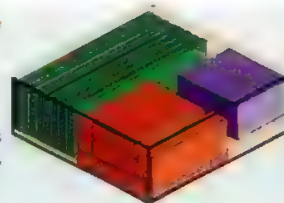
The motherboard currently does not have a socket for a Weitek 4167 coprocessor, though the company plans to release a 486 with one by the time you read this. The current configuration of the 486/33 EISA may dissuade some customers from purchasing it, because the tasks that most 486s will be called on to perform benefit from



FACT FILE

Wedge 486/33 EISA

Wedge Technology Inc., 1587 McCandless Dr., Milpitas, CA 95035; 408-263-9888



List Price: With 2MB RAM, 1.2MB or 1.44MB floppy disk drive, VGA video adapter, VGA monochrome monitor, \$5,037; with 8MB RAM, 128K processor RAM cache, 200MB hard disk, Super VGA monitor, DOS 3.3 or 4.01, \$6,675.

In Short: A reasonably priced system, the Wedge 486/33 EISA packs a standard assortment of name-brand components into a capacious small-footprint case. All that's missing is a place for a Weitek coprocessor.

CIRCLE 810 ON READER SERVICE CARD

the use of a Weitek.

Most 486s on the market will see duty as file servers or CAD platforms. Appropriately, Wedge allows up to 64MB on the motherboard using 4MB SIMMs. The

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COMPUTERS

EISA 486/33s

486/33 offers six 32-bit and two 8-bit slots, which is an achievement given the relatively compact dimensions of the machine, particularly since this 486/33 does not require a proprietary memory slot to reach its maximum memory configuration.

Our tested unit came with a 200MB Maxtor hard disk with a Bustek floppy/hard disk controller and a single 1.2MB TEAC floppy disk drive. Power users may consider paying for one of the two larger hard disk options, the \$1,269 337MB or \$1,895 675MB SCSI disk, especially for server applications.

The 486/33 EISA's processor and memory test times were average, which in this class still reflects a good deal of speed. Although it presents most of the features power users need, its lack of Weitek 4167 support will have you looking elsewhere when you need serious number-crunching support.

Wedge currently offers a one-year parts-and-labor warranty. The company also plans to install a toll-free technical support line.

The only feature that differentiates this machine from other systems is its small-footprint case. Still, the Wedge's limited drive capacity and lack of Weitek support may deter some power-hungry users.

ZEOS INTERNATIONAL

Zeos 486-33 EISA

by Bill O'Brien

Zeos has beaten most of its competition by providing outstanding equipment at affordable prices. Its 486-33 EISA venture is certainly outstanding, but with 8MB of RAM, a 327MB hard disk with caching controller, a Super VGA display subsystem, and DOS 4.01, it won't lower any price barriers at \$9,245.

By contrast, Zeos's basic configuration of the computer is both surprisingly usable and affordable. For 2MB of RAM, no external cache, an 85MB IDE hard disk and a monochrome graphics display subsystem, you'll pay \$4,995. Likewise, a step up in performance to an 8MB machine with 128K of external cache, a 200MB IDE hard disk, and a 512K VGA display subsystem means an outlay of only \$7,120. With the lowest-priced alternative, you won't get the caching SCSI bus-mastering hard disk controller card, the 1MB of video RAM, the 450-watt power supply, and the DOS 4.01, *Microsoft Windows 3.0*, and *Microsoft serial mouse* included with

the most expensive versions.

Externally, Zeos's tower enclosure appears to be just another box run off with the same stamp as many of the other computers in this review. But Zeos has a reputation for tweaking and refining that shows here as well. Zeos's major contribution is the addition of two 3.5-inch drive bays tucked neatly under the standard six half-height bays. With eight devices to contend with, the engineers at Zeos rightly included the PC Power and Cooling Turbo 450, a 450-watt power supply. Its dual exhaust fans will keep your computer cool under pressure.

Zeos International has also opted for a Mylex motherboard with an Intel EISA chip set and a combination of peripheral controller and BIOS chips from Phoenix and Mylex. This selection allows the company to offer eight 32-bit EISA slots. However, you'll still need to deal with the question of memory expansion. Once the eight available SIMM slots are filled, as they were with the 8MB of memory installed in the reviewed machine, there remain only two possibilities for further memory expansion.

Carded RAM is, of course, one of the options, and there are several manufactur-



Zeos 486-33 EISA, \$9,245.

ers of 32-bit EISA RAM boards from which to choose. But carded RAM always causes performance penalties. Maintaining the performance edge of the EISA environment requires you to remove the 1MB SIMMs and replace them with 4MB units. Unfortunately, not only are 4MB SIMMs currently rare, but with 1MB SIMMs selling for an average of \$100, you'd be tossing out about \$800 in components.

It is quite possible that the cost of migrating from 8MB to 32MB could top \$3,000. It would be to your benefit, then, to plan for the maximum utilization of the computer, whether as a standalone system, a CAD/CAM station, or a network server. Should your requirements exceed the 8MB boundary, you'd be better off ordering the machine with 4MB SIMMs installed.

The Zeos 486-33 EISA includes a 30-day return policy and a one-year warranty on parts and labor (five years for the keyboard) supported through Zeos's standard-setting 24-hour toll-free support lines. Backup service for persistent problems is provided on-site through TRW at Zeos's discretion. These extras, coupled with the software included with the system and its fast scores on PC Magazine Labs' benchmark tests, will place the Zeos 486-33 EISA high on your list of choices. ■

Bruce Brown, Bill O'Brien, and Winn L. Rosch are contributing editors of PC Magazine. Kellyn S. Betts, Fredric Burke, Patrick Honan, and John R. Quain are freelance writers and frequent contributors to PC Magazine.

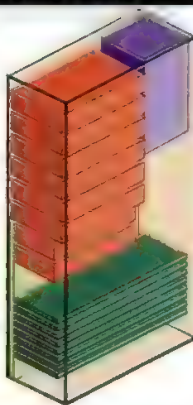
FACT FILE

EDITORS' CHOICE

Zeos 486-33 EISA
Zeos International,
530 Fifth Ave. NW,
St. Paul, MN 55112;
800-423-5891, 612-
633-5877.

List Price: With 2MB RAM, 85MB hard disk, 1.2MB or 1.44MB floppy disk drive, Hercules monochrome display subsystem, \$4,995; with 8MB RAM, 128K processor RAM cache, 200MB hard disk, both floppy disk drives, Super VGA color display subsystem, DOS 4.01, *Microsoft Windows 3.0*, mouse, \$7,120; with 327MB hard disk, 2MB caching disk controller, Super VGA color display subsystem with 1MB video RAM, \$9,245.

In Short: With a significant amount of bundled software and a superlative service and support plan, Zeos's entry is almost a must for the corporate user. Here is one system that's worth a bump into the \$9,000-plus region.



CIRCLE 663 ON READER SERVICE CARD



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Best of all, nearly any program that now runs on your PC will work with

Software Carousel. Even RAM resident utilities, graphics programs and network software. And Software Carousel works on all types of PCs. So you can have the kind of multi-application capability you want, without buying anything new.

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Thanks to Print'N'Run, new Software Carousel is also an advanced print handler. One that quickly takes over your printing jobs by accepting all the output bound for the printer, then sending it to the printer as fast as it can take it.

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No more wasted time waiting for your printer. No more lost productivity.

OLE. A network idea whose time has come.

OLE is the optional Open Link Extender* for Software Carousel. And it could be the best thing to happen to networks since OS/2 itself.

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any host or service over a network—whether it's a mainframe, a mini, etc.—then “switch away” to work on another application, and not lose your connection.

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And OLE works with all kinds of connection software. Including IBM, Attachmate, and others. Without changes to your hardware or software.

Even the experts agree.

Garry Ray, writing for PC Week, said, “Of these alternative operating environments (OS/2, DesqView and Software Carousel), Carousel may be the best choice of the day.”

Barry Simon of PC Magazine concurred with, “...I find it difficult to imagine using my computer without Carousel.

This package has become an essential tool and one that I strongly recommend.”

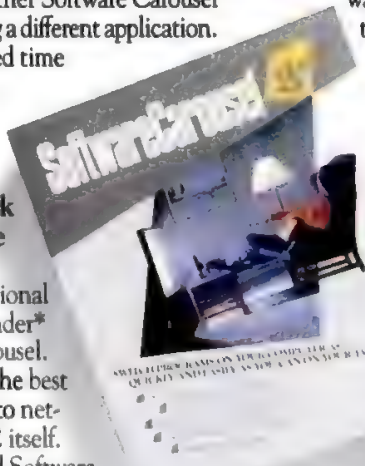
So if you really want the major benefits of Windows and OS/2, don't get grounded with high cost and mind-bending complexity.

Take off today with Software Carousel. It's easy. And it's just \$89.95.

CIRCLE 724 ON READER SERVICE CARD

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EDITORS'
CHOICE

October 30, 1990
Software Carousel, Version 4.0



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Computer Monthly,
PC Brand 286/16,
Product Review

286/16MHz and 286/20MHz ISA Systems

286/16 and 286/20 Base Systems

Customize with the Video and Hard Drive options of your choice

- True 80286-16/20 with Zero Wait States
- Landmark Speeds:
20.6MHz (286/16), 26.7MHz (286/20)
- Norton SI 19.0 (286/16), 23.0 (286/20)
- 512K RAM (expandable to 8MB)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

\$549

\$649

286/16 and 286/20 Mono Packages

This preconfigured system includes all the features of our base systems with:

- 512K RAM (expandable to 8MB)
- 44MB/28Ms Hard Drive
- 12" Mono Graphics Monitor
- Hercules Compatible Mono Graphics Card
- 1.2MB or 1.44MB Floppy Drive
- High Resolution Mouse

\$989

\$1,089

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PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features

- 80286-16, 80286-20 operating at 16MHz or 20MHz with Zero Wait States
- 512K RAM expandable to 8MB on the System Board
- 1:1 interleaved Hard/Floppy Drive Controller, with 1MB second disk transfer rate
- 1 Parallel and 2 Serial Ports
- High capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery
- 80287 Co-Processor Support
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, NOVELL, 3COM, and PCNET compatibility

- Built in System Board LIM 4.0EMS hardware
- 7 Slot Motherboard Design (5 16bit & 2 8bit)
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Hard Drive Options

- 44MB/28MS
- 89MB/10MS
- 125MB/19MS
- 177MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640 x 480)
- Super VGA Color (1024x768)

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"The PC Brand
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performed at least
as well as the far
costlier Compaq...
We simply began
marveling at what
is surely the best
bargain in personal
computing."

Computer Buyer's Guide,
PC Brand 386SX-16,
Product Review

386/SX-16 Non Cache and 386/SX-20 Cache Base Systems

*Customize with the Video and Hard Drive
options of your choice*

- True 386™SX™ Processor operating at 16MHz or 20MHz w/Zero Wait States
- Landmark Speeds:
18.3MHz (SX-16), 28.9MHz (SX-20)
- Norton SI 18.7 (SX-16) 23.4 (SX-20)
- 512K RAM (expandable to 8MB)
- 64K CPU Ram Cache (SX-20 only)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

\$799

\$899

386/SX-16 Non Cache and 386/SX-20 Cache Super VGA Packages

*This preconfigured system includes all the
features of our base systems with:*

- 2MB RAM (expandable to 8MB)
- 44MB/28Ms Hard Drive
- 14" Super VGA (1024 x 768 Resolution)
Color Monitor
- 16 Bit High Performance Super VGA Card
with 1MB Video RAM
- Dual 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

\$1,943

\$2,043

All Systems also include: On-Site Service by TRW¹, Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

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Standard Features

- True 386™SX™ Processor operating at 16MHz or 20MHz with Zero Wait States
- 512K RAM expandable to 8MB on the System Board
- 64K CPU RAM Cache (SX-20 only) with Posted Write
- 1:1 interleaved Hard/Floppy Drive Controller, with 1MB second disk transfer rate
- 1 Parallel and 2 Serial Ports
- High capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery

- 387™SX™ Co-Processor Support
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, NOVELL, 3COM, and PCNET compatibility
- 8 Slot Motherboard Design (5 16bit & 3 8bit)
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Hard Drive Options

- 44MB/28MS
- 89MB/19MS
- 125MB/19MS
- 177MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640 x 480)
- Super VGA Color (1024x768)

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"The Best
Low Cost
Alternative
Around"

PC Magazine,
PC Brand 386/25.
Product Review



"...Flawless
Compatibility,
Lowest Price."

InfoWorld,
PC Brand 386/33,
Product Review

386/25 Non Cache and 386/25 & 33 Cached ISA Systems

386/25 Non Cache Base System 386/25 & 33 Cache Base Systems

Customize with the Video and
Hard Drive options of your choice

- True 25MHz or 33MHz Intel 80386 CPU operating with Zero Wait States
- Landmark Speeds:
33.6MHz (386/25 Non Cache)
43.5MHz (386/25Cache),
58.7MHz (386/33Cache)
- Norton SI 28.2 (386/25 Non Cache)
31.6 (386/25Cache), 45.9 (386/33Cache)
- 1MB RAM (expandable to 16MB)
- 1.2MB or 1.44MB Floppy Drives
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz
Non Cache \$999

25MHz
Cache \$1,199

33MHz
Cache \$1,399

386/25 Non Cache SVGA Package 386/25 & 33 Cache SVGA Packages

This preconfigured package includes
all the features of our base system with:

- 4MB RAM (expandable to 16MB)
- 89MB/19MS Hard Drive
(386/25 Non Cache)
- 125MB/19MS Hard Drive
(386/25 & 33 Cache)
- 14" Super VGA (1024 x 768
Resolution) Color Monitor
- 16 Bit High Performance Super VGA
Card with 1 MB Video RAM
- Dual 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz
Non Cache \$2,422

25MHz
Cache \$2,768

33MHz
Cache \$2,968

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Standard Features

- True 25 or 33MHz Intel 80386 CPU Operating with Zero Wait States

- 387 or Weitek Co-Processor Support
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX.

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640 x 480)

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PC Magazine,
PC Brand 486/33,
Product Review

486/25MHz and 486/33MHz Cashed ISA Systems

486/25 and 486/33 Base Systems

Customize with the Video and Hard Drive options of your choice

- True 25MHz or 33MHz Intel 80486 CPU operating at Zero Wait States
- Landmark Speeds:
114.1MHz (486/25), 150MHz (486/33)
- Norton SI 41.5 (486/25), 51.5 (486/33)
- 1MB RAM (expandable to 32MB)
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz **\$1,949**

33MHz **\$3,399**

486/25 and 486/33 Super VGA Packages

This preconfigured system includes all the features of our base systems with:

- 4MB RAM (expandable to 32MB)
- 125MB/19Ms Hard Drive
- 14" Super VGA (1024 x 768 Resolution) Color Monitor
- 16 Bit High Performance Super VGA Card with 1MB Video RAM
- Dual 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz **\$3,518**

33MHz **\$5,038**

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Standard Features

- True 25MHz or 33MHz Intel 80486 CPU Operating at Zero Wait States
- 1MB RAM expandable to 32MB
- Built-in 8K 4-Way Set Associative Cache
- Built-in Intel 487 Numeric Coprocessor
- Optional 128K or 256K auxiliary CPU Cache Card
- Optional Weitek Card
- 1:1 interleaved Hard/Floppy Drive Controller, with 1MB second disk transfer rate
- 1 Parallel and 2 Serial Ports
- High capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery

- 7 Slot Motherboard Design with one 32bit proprietary Zero Wait State Slot
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, UNIX, NOVELL, 3COM, and PCNET compatibility
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Hard Drive Options

- 44MB/28MS
- 89MB/19MS
- 125MB/19MS
- 177MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Video Options

- Mono Graphics
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- VGA Color (640 x 480)
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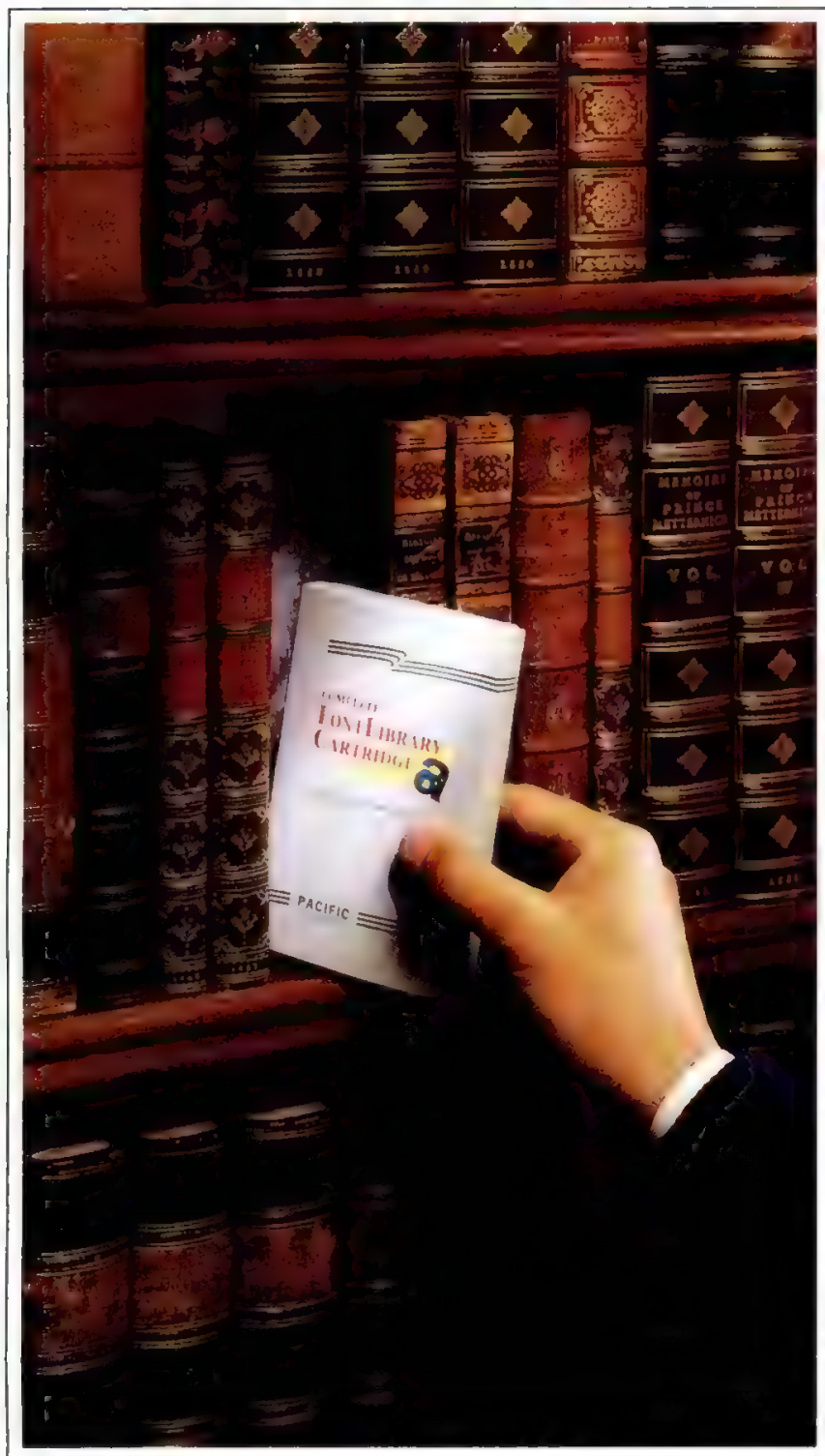
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AGFA 

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DATA PRODUCTS

ENDURANCE TESTS



Graphics Hardware

by Jennifer Zaino

Today, graphics hardware encompasses a veritable smorgasbord of peripheral items. Whether you're a CAD user, an electronic artist, a desktop publisher, or a budding videographer, it's likely that you've had at least cursory contact with one of the products we review here, or at least with one of the ever increasing number of offerings in the applicable product category.

From digitizing tablets to high-resolution monitors to multimedia devices, the graphics hardware offerings we tested over a period of months span the spectrum from the old and established to the young and up-and-coming.

In this endurance test, we report the results of our months-long investigation of three digitizing tablets, two 1,024-by-768 monitors, and two VGA-to-NTSC boards. With graphics technology exploding on the scene on all fronts (*Microsoft Windows 3.0* was almost as much a result of this movement as it was a catalyst), this choice of product categories presents an opportunity to draw a historical timeline that shows us both where we've been, and where we're going.

For example, Summagraphics, one of the tablet manufacturers we include here, began making digitizers almost ten years before the birth of the IBM Personal Computer. Talk about an endurance test! Kurta and Wacom, the other digitizer players in this endurance test, have been selling their products since 1985 and 1983, respectively. The actual technology behind digitizing tablets has, of course, con-

tinually advanced, but the product category in general shows no signs of being dated. As our reviewers can attest from months of personal experience with drawing and CAD programs (and despite whatever problems they encountered), even today there is simply no better way to input certain kinds of information.

The technology behind 1,024-by-768 color noninterlaced monitors represents the midrange of the graphics timeline. They have, like 33-MHz 386 PCs, recently entered the more affordable (if not actually inexpensive) and more comfortably middle-class stage of their existence. The two products we review here, the \$1,499 NEC MultiSync 4D and the \$3,799 Nanao 9400, generally offered the reliable performance you want from an established technology. Perhaps one of the more interesting things we learned had nothing to do with the monitors at all, but with the video card to which one of them was attached.

Last but not least, this endurance test took us into the exciting, up-and-coming world of multimedia. As the junior entry on the graphics timeline, it is perhaps not unexpected that long-term testing of the products revealed a certain amount of immaturity in the technology. On the positive side, our authors also discovered the real and as yet largely unleashed potential of the technology. Who knows but that the innovators in this area won't someday be sitting pretty way over on the other side of the timeline?

DIGITIZING TABLETS

KURTA CORP.
Kurta IS/ONE
Digitizer
by Jim Boyce

The aspects of the Kurta IS/ONE that I came to appreciate most over the months in which I used it were the freedom of movement and the ease of switching between devices afforded by the product's cordless technology.

The three-switch pen and the four-button cursor, which are both cordless, are powered by alkaline batteries. Both devices are enabled via a capacitance circuit activated only by contact with your hand, a design that extends battery life. I had no problem getting the pen running,



OUR CONTRIBUTORS

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Lori Grunin is a project leader at PC Magazine Labs.

Robert W. Kane is technical director of PC Magazine Labs.

Gary W. Kaplow is associate graphics director of *PC Magazine*.

Luisa Simone is a contributing editor of *PC Magazine*.

Jennifer Zaino is an associate editor of *PC Magazine*.

but the cursor needed a slightly firmer grip to operate than I'm used to with corded cursors. This wasn't a problem; it just took a few days to get used to. We also received a corded cursor, which worked as well as any I've used, and a corded pen that proved wonderfully light and thin. (One cursor and stylus are included in the 20- by 16-inch IS/ONE's \$995 price.)

Since there are no cables to change and no DIP switches to set, switching between the cordless cursor and pen required nothing more than picking up the one I wanted—definitely a nice feature. For example, in *AutoCAD*, it was a pain-free process to use the cursor for menu choices and the pen for freehand work. Also, switching from mouse mode to digitizer mode was completely transparent.

The IS/ONE's driver program serves as an *AutoCAD* ADI driver, a Microsoft

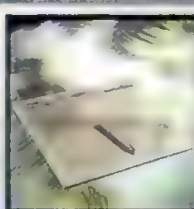
Mouse driver, and a *Microsoft Windows* driver. Kurta's ADI driver worked fine with *AutoCAD*, Releases 10 and 11, and I had no problems setting up the menu, defining the active screen and menu regions, and assigning commands to buttons. Using the entire tablet with Autodesk's standard *AutoCAD* template overlay and file required modifying *AutoCAD*'s template file, but that is a limitation of the CAD program, not the IS/ONE.

The *Windows* portion of the driver worked with *Windows* 3.0 in Real and Standard modes, but locked the system in enhanced mode if I switched to a non-*Windows* application that required a mouse, then switched back into *Windows*. The problem was solved by loading a Microsoft-compatible mouse driver along with the Kurta driver. With the non-*Windows* application using the mouse driver (though driven by the IS/ONE), everything worked fine in Enhanced mode, and I found myself switching happily between *Windows* and non-*Windows* applications.

Pointer tracking using any of the Kurta's cursors or pens in applications like *Windows Paintbrush* was somewhat slower than with a mouse, causing the brush tool to lag behind the mouse slightly. But the IS/ONE worked fine for all other *Windows* functions.

The IS/ONE has a lifetime warranty on both the tablet and pointing device. The tablet itself has to be shipped back for repair, but turn-around time is reportedly quick. Kurta will ship a replacement pointing device on your call, and you return the defective part when the new one arrives. A personal experience enabled me to verify the company's quick response. A problem that turned out to be the result of a loose connection inside the cordless pen cap made me suspect the batteries, which I then tried to remove. However, they apparently expand inside over time, making removal a major undertaking. I tried tapping the pen to get them out, and when that didn't work, I resorted to flicking it like a thermometer to force them out. That got them out—along with the stylus' electronic guts, buttons, and point. The tech support was helpful, and got a replacement to me right away (I should mention that I did *not* let on that I was writing an article about the product for *PC Magazine*).

With only a few minor glitches, the IS/ONE worked consistently and well in all modes. This is one tablet I would be happy to buy for myself.



Last Review: November 28, 1989, page 258

Reason Selected: Editors' Choice

Positive Findings: Painfree switching between cursor and pen; cordlessness enables freedom of motion.

Negative Findings: Batteries inside cordless device expand over time and are difficult to remove; tracking with cursor and pen somewhat slower than with a mouse.

RELIABILITY

COMPATIBILITY

PERFORMANCE

Kurta IS/ONE Digitizer

Kurta Corp., 3007 E. Chambers St.,
Phoenix, AZ 85040; 800-445-8782, 602-
276-5533.

List Price: \$995 (with one cursor and
pen).

Requires: Serial port.

CIRCLE 390 ON READER SERVICE CARD

SUMMAGRAPHICS CORP.

SummaSketch II Professional

by Gary W. Kaplow

As an electronic graphics artist, I was thrilled at the idea of putting the SummaSketch II Professional through its paces for a few months. Here was a chance to illustrate using the PC equivalent of a traditional artist's tools, paper and pencil.

Installation of the \$999 tablet (the price includes a two-button pen and a four-button cursor) was actually quite simple, although the documentation made it look difficult. The few snags I ran into were quickly resolved by the company's able technical support staff.

Because of the Professional's large size—23 inches wide by 17.5 inches long—and my limited desk space, I often had to move it out of the way to make room for other projects. (Its sibling, the otherwise identical Editors' Choice-winning Summagraphics II measures 16.3 inches wide by 16.5 inches long.) Even with the occasional bang and jolt it suffered, it still performed perfectly—not a rattle or a chip.

A universal mouse emulator is included, making the product compatible with packages that support the Microsoft mouse emulator. Drivers for Autodesk programs like AutoCAD and Animator



and Microsoft Windows, Version 2.0 and later, are also shipped, although the closest we got to a Windows 3.0-specific driver was a prerelease version that performed quite well. (Summagraphics says the final driver will ship in early 1991.)

The tablet enhanced my productivity in one important respect. Although I am left-handed, I use a mouse with my right hand. The pen, however, fits naturally in my left hand; when working in paint programs in both Windows and non-Windows environments, I felt more comfortable than I ever did with a mouse. Even if you're not a lefty, you'll find that the pen is much more conducive to the freehand drawing environment of paint programs than is a mouse. Importantly, the connecting cord did not prove a nuisance.

Under the Windows environment (exclusive of paint programs), I preferred the four-button cursor. I tried the pen with many of these applications, such as *Micrografx Designer* and *Corel Draw!*, but for me, the more mouselike cursor just felt better and provided greater accuracy. However, others I know enjoyed using the pen in the same applications.

I found the overall tablet size to be overwhelming in Windows; getting across the screen took a lot longer and a lot more physical effort. To remedy this I modified Windows' SYSTEM.INI file to activate only a small area of the tablet. Unfortunately, this also cut down on the precision (the tradeoff is common to all digitizers).

The Professional has a sensitivity range of half an inch. This came in handy when I needed to trace off a thick material like cardboard. But you can't regulate the sensitivity. In applications like *Designer*, I would place one point in one position and then move to place a second, separate point in another location. If I wasn't careful to raise the pointing device over half an inch above the tablet, it recorded the movement and I wound up with the two points accidentally connected. I learned to be more cautious, but a sensitivity regulator is necessary.

Additionally, the short cable that runs from the computer to the tablet restricts placement of the unit, and the power supply is bulky. These annoyances aside, though, the SummaSketch II Professional proved itself worthy of its leadership position in the industry.

SummaSketch II Professional

Summagraphics Corp., 60 Silvermine
Rd., Seymour, CT 06483; 800-243-
9388, 203-881-5400.

List Price: \$999 (includes two-button
stylus pen, four-button cursor, cables).

Requires: Serial port.

CIRCLE 391 ON READER SERVICE CARD

WACOM CO. LTD.

Wacom Model SD421E

by Charles Conover

Like Kurta's offering, Wacom's \$1,095 SD421E tablet (formerly known as the SD421L) is a cordless device, so you don't feel restricted when using either the pen or four-button cursor. Unlike the IS/ONE, none of Wacom's pointing devices use batteries; the product uses a give-and-receive magnetic resonance system, which relies on the energy that's briefly stored in resonant circuits. The absence of batteries allows the pointing devices to be ultralight, something I came to appreciate during long drawing sessions.

Wacom shipped two of its pressure-sensitive pens, which rely on the amount of pressure applied to their points to indicate the amount of force applied to the pen tip. The pressure represents an analog value that can be used by software to control the width of a drawn line or simulated brushstroke. While we pointed out that AutoCAD users may prefer Wacom's non-pressure-sensitive pens in our last review, they proved an amazing tool for someone in my line of work. I experienced the true beauty of pressure sensitivity when using tools like the chalk function in *Time Arts Lumina*; it actually felt as if I were sketching with pastel or charcoal and not an electronic pen.

Unfortunately, while at least a dozen software packages for the Mac address pressure sensitivity (for example, *Photoshop*, Letraset's *Colorstudio*, and *Pressure Paint*, which is bundled with the tablet), neither I nor Wacom could come up with any other DOS-based packages besides *Lumina* that take advantage of this feature. If vendors truly want to make the PC competitive with the Mac in the drawing arena, it seems only logical that they should work on supporting features such as this that appeal to artists.

Over the past year, the Wacom SD421E has been attached to a Vista-equipped PC,



and the combination has proved a tremendously versatile tool for animation and graphic design work. The Wacom's resolution of 1,270 lines per inch is more than adequate for most applications, including high-end CAD.

Wacom offers a *Windows 3.0* driver; under most nonpaint *Windows* applications, I recommend the four-button cursor. The pen caused a slight problem when plotting precise points, a big part of technical illustration programs like *Corel Draw!* and *Micrografx Designer*. The problem is the fault more of the user than the product, stemming from the fact that when I use a pen, I locate the point I want to touch, but as I press down to click, my hand has a tendency to pull back and I wind up selecting a point a little below the location I actually wanted.

One thing I definitely appreciated was that no matter how quickly I moved the pen or cursor back and forth across the pad, it kept up with no loss of lines and without any lag time. It was also just as responsive working in the corners of the actual digitizing area as it was in the middle, something certain other tablets can't handle. And its electrostatic hold-down feature—the tablet uses static electricity to keep a piece of paper in place while you trace it—proved invaluable. No tape, no shifting, no problem.

The tablet is heavy and has a large footprint, so it's not something you'll want to work with on your lap. However, its interior steel sheet shielding gave it industrial strength protection. Overall, the Wacom device shows a concern for the users' best interests. Many electronic artists come from a Mac background and won't want to give up options (like pressure sensitivity) that were available in that arena. Now if only DOS-based PC graph-



ics software programmers would follow Wacom's lead!

Wacom Model SD421E (formerly SD421L)

Wacom Co. Ltd., W. 115 Century Rd., Paramus, NJ 07652; 201-265-4226.

List Price: \$1,095 (includes choice of stylus, one pointing device, one IBM- or Mac-compatible interface kit, user's manual).

Requires: Serial port.

CIRCLE 400 ON READER SERVICE CARD

1,024-BY-768 MONITORS

NANAO USA CORP.

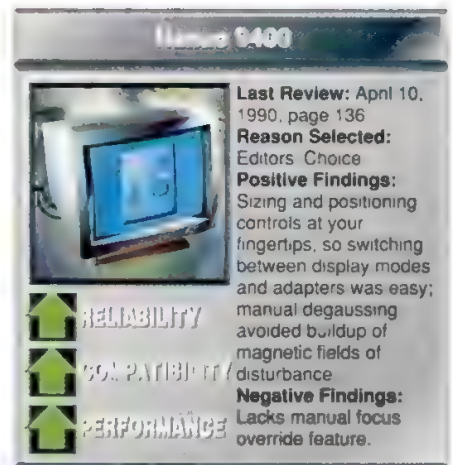
Nanao 9400

by Robert W. Kane

From a reliability standpoint, the Nanao 9400 monitor presented no problems over the months I used it. It always turned on, didn't require service, maintained positive response from all the controls, and survived the rigors of being moved from one location to another without so much as skipping a scan line.

Compatibility was not an issue with the Nanao. It handled a multitude of graphics adapters at varying resolutions, from 320-by-200, 256-color VGA to the 1,024-by-768, 256-color NEC Graphics Engine, with aplomb. (While the reviewer of the NEC MultiSync 4D experienced apparently heat-related problems with her Graphics Engine, I did not have any trouble, probably because my tower includes two fans. If you're using this card in a tower, keep in mind that the vertical arrangement of components may make a convection cooling feature a must-have.) The Nanao's automatic adjustments to handle sizing for various resolutions proved quite handy. Only minor adjustments were necessary for displaying different resolutions.

When adjustments were necessary, the positioning of the controls at the bottom front of the monitor proved exemplary in terms of placement and functionality. With all the sizing and positioning controls right at your fingertips, the 9400 made switching between display adapters and display modes easy. Better yet, Nanao's 9400i (the *i* stands for *intelligence*), which



should be shipping by the time you read this review, remembers the positioning and sizing settings for different resolution modes, and automatically makes them each time you switch.

An important feature of the 9400 was the manual degaussing button. Degaussing permits dissipation of built-up magnetic fields of disturbance in the monitor case. All monitors the size of the Nanao (19-inch diagonal or larger) are more susceptible to having colors or images distorted by these fields, and should offer some way to degauss the monitor.

While the 9400 has dynamic beam focusing (which means that you never have to manually adjust the picture focus), some people who used it for demonstrations complained that the images at lower resolution (VGA and Super VGA) were not as sharp as they could have been. While those complaints seemed to be tied to the video board as much as to the monitor, a manual focus override would have been a useful addition to the 9400's feature list.

Weighing in at 82 pounds and priced at \$3,799, the 9400 is no lightweight. But its flexibility at handling a number of display adapters and different resolutions, combined with its unquestionable reliability, makes it a heavyweight in features as well. With the Nanao 9400, you get what you pay for and a whole lot more.

Nanao 9400

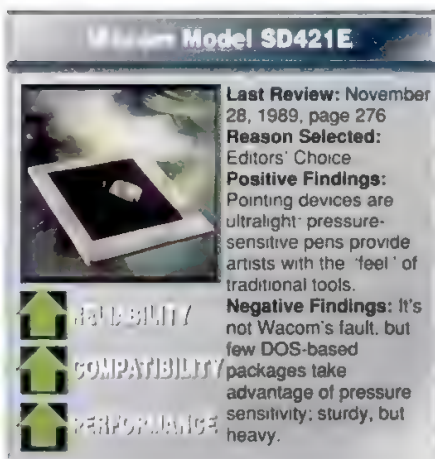
Nanao USA Corp., 23535 Telo Ave., Torrance, CA 90505; 213-325-5202.

List Price: \$3,799 (includes cables, swivel stand, 15-pin- to-9-pin adapter).

Requires: VGA, Super VGA, 8514/a or 1,024-by-768 graphics adapter or 1,280-by-1,024 graphics adapter.

Diagonal Screen Size: 19 inches.

CIRCLE 401 ON READER SERVICE CARD



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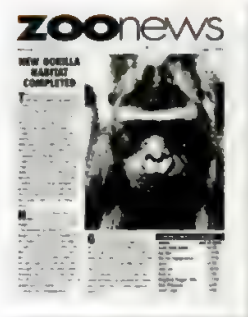


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Exhibit A: The Shot. Rick Muller's masterpiece to the right. We call it 'Color Separating.' Captured by Nikkor optics, it was scanned on the LS-3500.

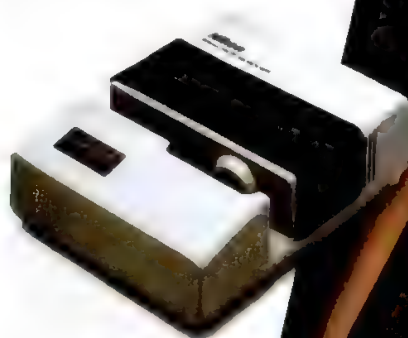
Exhibit B: The Reviews. "★★★★/." [The LS-3500] wins overall for flexibility in resolution and for the wide range of controls it offers," said MacUser.* To quote a MacWEEK comparison, "The Nikon scanner's self-calibration and auto-focusing set a new standard in ease of use for slide scanners. It's also noticeably faster..."**

The LS-3500 Scanner provides the same results on a Macintosh*, IBM*, MS-DOS or UNIX* system

Exhibit C: The Real Upshot. Concerned that our 35mm format might be limiting? Please note:

Exhibit A began life as an 8x10 transparency. Also note that the LS-3500 performs equally well with negatives and monochromes. So, ultimately, the format of your source material is largely immaterial.

For more information, write or call Nikon Electronic Imaging, Dept. B2, 101 Cleveland Avenue, Bayshore, NY 11706, (516) 547-4355. Or call 1-800-NIKON-US for the nearest dealer.



DESKTOP COLOR SEPARATING DEFINED: THE NIKON LS-3500.

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CIRCLE 329 ON READER SERVICE CARD

NEC TECHNOLOGIES INC.

NEC MultiSync 4D

by Lori Grunin

Although NEC's \$1,499 MultiSync 4D was this endurance test's true object of scrutiny, the past six months served as an ongoing reminder of how tightly intertwined the functions of the display and video adapter are.

I used the 4D with NEC's own \$1,499 Graphics Engine. Once the pair was installed, I eagerly tried to run *Windows* in high-resolution (1,024-by-768) mode. It jittered like a sock hop—utterly unusable. In straight VGA, however, the display was perfectly steady. The troubleshooting section of the manual didn't help, and a call to NEC's technical support proved frustrating; I should not have had to offer all the suggestions as to the source of the problem (especially since I turned out to be wrong). Right or wrong, we decided that it was probably a circuitry problem and that I should exchange the monitor for a new one that NEC promised to send me promptly.

I continued to use the pair in VGA mode until I was able to make the exchange. At some point, the on/off switch stopped working as well (although NEC says that when it received it, the switch was working properly—just like a car that purrs for the mechanic but hisses for you). The next 4D was dead on arrival: Power was going in, but nothing was happening. I didn't keep it around much longer before it too went back.

The third and final 4D manifested the same symptoms as the first; this time, I pulled out the old Graphics Engine and plugged in a new one. Problem solved. A conversation I had with the Graphics Engine product manager revealed that the

board—especially the RAM—can be heat sensitive, and that since my machine is a tower that comes with only one fan and is jam-packed with cards (in which the upper cards bake in the heat rising from the lower cards), I was probably frying my Graphics Engine. (NEC recommends moving the card to the lowest slot.) Since the on-board RAM is necessary for high-

Months spent with Magni Systems' VGA Producer revealed that the success of the video output was highly dependent on the application being used.

resolution operation, the resulting display was broadcasting from somewhere in the Twilight Zone.

Once I adjusted the board and got the pair up and running properly, it was smooth sailing for some time (although the board has once again begun showing signs of heat prostration).

When using *Windows* and switching between the high-resolution graphics mode and VGA-resolution, DOS yields the inevitable mode-switch click, but takes place smoothly with no display anomalies. Single-pixel lines appear clean and steady.

The monitor's front controls are certainly convenient, although the panel that covers them is rather flimsy and prone to snapping off. And even in non-graphics-specific programs such as *Microsoft Excel* and *Word for Windows*, the increase in resolution and display area that the 4D provides makes a world of difference.

NEC MultiSync 4D
NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 708-860-9500.

List Price: \$1,499 (includes cable).

Requires: VGA, Super VGA, 8514/a or 1,024-by-768 graphics adapter.

Diagonal Screen Size: 16 inches.

CIRCLE 402 ON READER SERVICE CARD

VGA-TO-NTSC BOARDS

MAGNI SYSTEMS INC.

VGA Producer

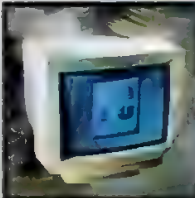
by Luisa Simone

Installing Magni Systems' \$1,695 VGA Producer is either difficult or expensive. You can choose to struggle with the special carrier connector that requires you to remove your VGA card's socketed RAM DAC, or buy the \$599 Metheus Premier VGA board that comes with a special cable connector for the VGA Producer. I got the Metheus board, so the hardest part of the installation was finding BNC-to-RCA cables.

The months I worked with the unit revealed that the success of the video output was highly dependent on the application I was using. Working with *Autodesk Animator* was a breeze. The 320 by 200 pixels fit comfortably on screen, and the moving images helped distract from the flickering that is bound to occur when you translate a noninterlaced signal to an interlaced television screen.

Creating a demo tape of a *Windows* application running in 640-by-480, 16-color mode, however, was fraught with problems, which mostly revolved around discrepancies between the VGA and NTSC standards. First of all, the image bled off the screen. I reduced the overscanning problems by switching into horizontal underscan mode, and by repositioning the image vertically. This works at the expense of maintaining the original aspect ratio.

The flicker was mitigated somewhat by reconfiguring the *Windows* interface to display only solid hardware colors. The



NEC MultiSync 4D

Last Review: April 10, 1990, page 136
Reason Selected: Editors' Choice
Positive Findings: Good-size display area; solid high-resolution picture; attractive cabinet, supports several types of input connectors.
Negative Findings: Cable too short (restricts location of unit); front control panel cover too flimsy.

RELIABILITY

COMPATIBILITY

PERFORMANCE



VGA Producer

Last Review: July 1990, page 199
Reason Selected: Editors' Choice
Positive Findings: In the last six months, my mouse driver has caused more problems than the VGA Producer.
Negative Findings: Remote-control unit is a clumsy way to switch between options; the VGA Producer just could not handle some consumer-grade VCRs.

RELIABILITY

COMPATIBILITY

PERFORMANCE

NTSC signal doesn't know what to do with a dithered color (*Windows* tricks you into seeing more than 16 screen colors by placing two very different color pixels, like blue and white, next to each other) because dramatic frequency changes in adjacent pixels is outside of the NTSC bandwidth.

Even with that adjustment the shimmering, jittering TV image was unnerving. The arrival of Magni Systems' new \$495 daughterboard stabilized flicker by averaging the intensity levels of every two interlaced lines on the television. The shift to a mostly stable image was wonderful, and though the resulting image was somewhat softer, the trade-off proved acceptable for all graphics (and even some text) applications.

I had no problems recording VGA graphics to a standard VCR from the Magni board. However, a VCR video source (also a consumer-grade VCR) was impossible to get running. The two hardware solutions—changing the sync source to the external signal, and toggling between fast and standard lock—didn't work. Magni's tech support staff was honest about the situation: with older equipment or with VCRs that don't have tight quality control, it just can't lock onto the signal.

I found the Magni technical staff to be more than just helpful. I was never kept on hold, the people I spoke to were knowledgeable, and frankly, I learned a lot about connecting video equipment to my PC.

The VGA Producer's user interface consists of a remote-control box, which I loved using to cut and fade between video and computer generated graphics. However, the same fade and cut buttons are also the means for toggling between the board's many options. I finally resorted to a crib sheet to remember the arbitrary combinations.

VGA-to-NTSC conversion still has a long way to go. If you want to be on the cutting edge, buy the VGA Producer today. If you want to wait until all the solutions are in place, watch Magni closely, because it is on the right track.

VGA Producer

Magni Systems Inc., 9500 SW Gemini Dr., Beaverton, OR 97005; 800-624-6465, 503-626-8400.

List Price: VGA Producer \$1,695, Flicker Stabilizer factory upgrade, \$495; VGA Producer with Flicker Stabilizer installed, \$2,190.

Requires: 80286/80386 AT-style computer, VGA card with 28-pin socketed



RAM DAC VGA adapter, VGA or multiscanning monitor, NTSC video monitor, videocassette recorder or camera

Source:

CIRCLE 403 ON READER SERVICE CARD

USVIDEO INC.

USVideo TVGA

by Thomas W. Giebel

After working with USVideo's \$799 TVGA (formerly known as the VGA/NTSC Recordable) and \$399 Genlock Overlay Module for some months, I've experienced both the excitement and frustration of multimedia technology. My experiments with this Editors' Choice winner proved that you can use it with your PC to create many kinds of video presentations, but the technology is somewhat unstable, and putting together a complicated production can be a daunting undertaking.

The installation and use of the board couldn't be easier. I simply replaced my VGA card with the 16-bit card/daughter-card, which took up a slot and a half. It worked fine with the factory DIP and

with a sliding bar, or by entering a three-digit number.

The TVGA doubles as your everyday video adapter. Fortunately, its performance as a VGA card was more than adequate. It automatically emulates MDA, HGC, CGA, EGA, VGA, or the video mode can be set manually with software. The image quality was fine, although it could achieve higher resolution with more video memory. There is room for 512K on the board, but it is supplied with only 256K, and USVideo does not offer an upgrade. Software drivers for programs like *Lotus 1-2-3*, *Microsoft Windows*, and *AutoCAD* are also supplied with the TVGA package.

The board's performance suffered in NTSC mode, when the picture experienced frequent jitter. Sometimes the VGA output itself, even without an underlying video signal, became unreadable because of jitter, crawl, or out-of-register colors. When the image remained stable, it was easy to synchronize video and VGA animation to record quality output. Other times the VGA output picture would degenerate in the middle of recording, making it necessary to recue everything and start over.

A long-distance call to USVideo's technical support line was dealt with quickly and efficiently. The technician, however, didn't give much insight into the jitter besides telling me to check the jumper settings and use good-quality video cables. He also predicted that the problem would go away if I used live camera rather than a recorded video signal as video-in. This turned out to be true, but I found it impossible not to rely upon prerecorded video material for producing the presentation I wanted.

USVideo has big plans for the TVGA. A digitizer module is now available, with sound- and frame-grabbing modules in the works. However, for the most part, this is still an immature technology. Although it's not marketed this way, perhaps you'll find the TVGA most useful as a good prototyping tool. ■

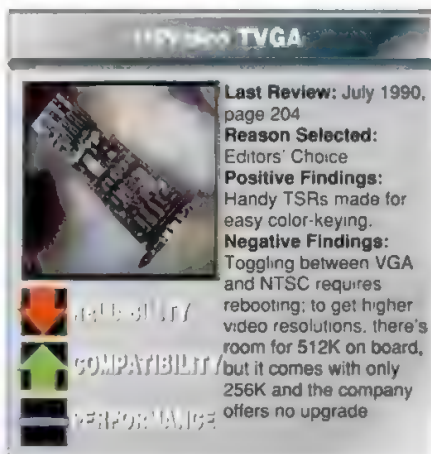
USVideo TVGA

USVideo Inc., One Stamford Landing, 62 Southfield Ave., Stamford, CT 06902; 203-964-9000.

List Price: TVGA, \$799; Genlock Overlay Module, \$399.

Requires: Multiscanning monitor supporting a scan rate of 15.73 kHz, NTSC video monitor, videocassette recorder.

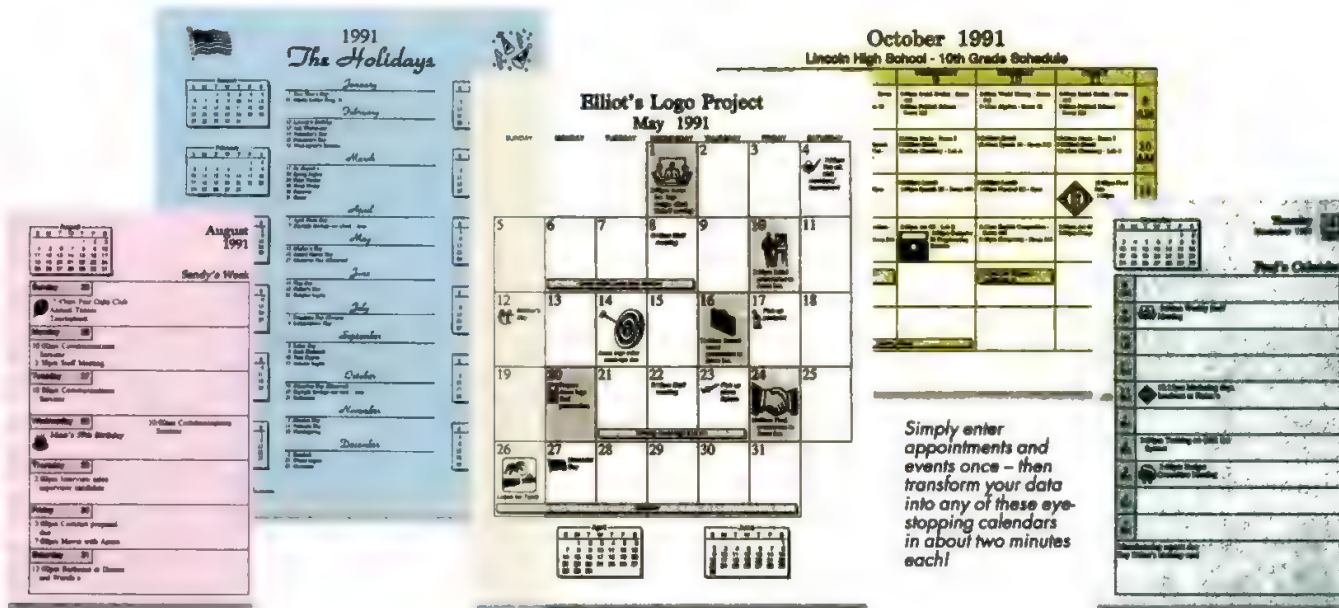
CIRCLE 404 ON READER SERVICE CARD



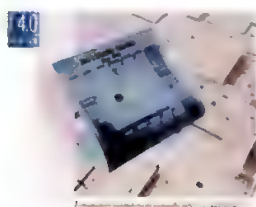
jumper settings.

The supplied software utilities were very handy in the long run. Particularly useful was USVMENU. It allowed me to save different configurations into .COM files, which could be used to recreate the same setup anytime. Three TSRs made it a snap to specify key colors for genlocking. One let me set the key color by pointing to a pixel on the screen with a mouse; others let me change the key color

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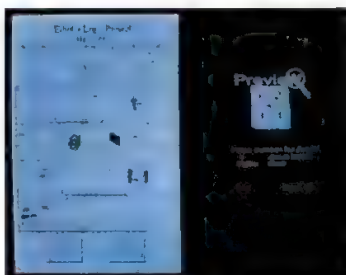
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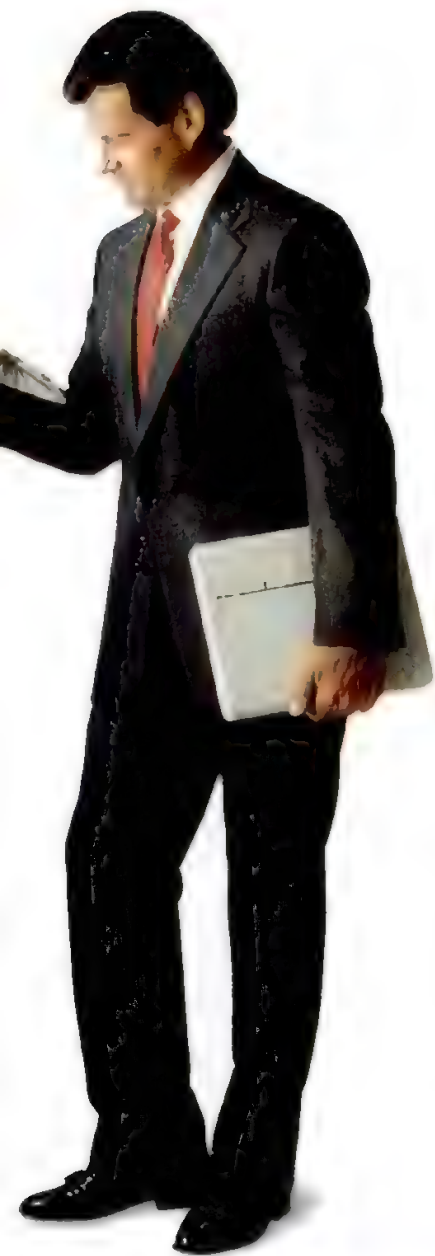
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 - 3.5" 1.44MB floppy drive.
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 - Weighs under 6 pounds.
- CIRCLE 138 ON READER SERVICE CARD

Specifications are subject to change without notice.

by
Scott Chaney

Utilities

Computers thrive on the repetitious tasks that bore people silly. So why, day after day, should we be the ones to make the same selections from the same menus to get our applications to work? Why should we mindlessly tap our way through the same keystroke ritual to load our communications program, log on, and collect our e-mail?

This issue's utility automates such repetitive entries. ENCORE lets you record a sequence of keystrokes and the pauses between them necessary to perform an entire task. When you need to execute that task again, simply hit a single key to replay the whole record at its proper pace. For example, I must make selections from a whole raft of menus before I can get my desktop publisher to print a document. My choices are always the same, but I have to enter them each time anyway. With ENCORE I record the first session and from then on just press Ctrl-P to replay the session when it's time to print.

You can get a copy of ENCORE.COM by downloading it from PC MagNet (see the PC MagNet page immediately following this article). If your modem setup can't handle binary files, you can download ENCORE.BAS instead; running this file in BASIC will then create ENCORE.COM for you. The source code, ENCORE.ASM, is also available from PC MagNet. As an alternative, we can fax or mail you the source code listings. Simply send a postcard with your name, address, and fax number (if applicable) to Utilities, PC Magazine, One Park Avenue, New York, NY 10016; Attention: Katherine West.

The full syntax for using ENCORE is

```
ENCORE [/S] [/L] [/U]
[/Kn.../Bn.../P]
```

When you enter ENCORE at the DOS prompt, it loads itself into memory as a small (approximately 1K) TSR with an internal buffer that holds up to 100 keystrokes. Anytime thereafter, you can start recording a keystroke sequence by pressing Ctrl-R, the record hotkey; a beep con-

Automate Your Program Operations With ENCORE.COM

■ Repeating the same menu-choice sequences over and over can be a thing of the past with this task macro generator.

firms that recording has been initiated. When you're through entering your keystrokes, you press Ctrl-R again. This time you'll hear two beeps, which indicates that the recording has been terminated. To play your recorded keystrokes just press ENCORE's hotkey, Ctrl-P. You can break out of a playback at any time by pressing the Esc key. The sidebar "Changing ENCORE's Hotkeys," explains how to substitute other hotkeys in case the defaults conflict with those of other programs you use.

To save a recorded keystroke sequence to a file, you use the /S switch as follows:

```
ENCORE /S filename
```

Don't use an extension as part of the *filename*; to work properly, ENCORE must add its own .ENC extension. Similarly, to load a stored keystroke sequence from a file back into ENCORE's buffer so that you can replay it at your convenience, use the /L switch as follows:

```
ENCORE /L filename
```

Note that /S, /L, and /U (the uninstall switch) can be invoked only *after* EN-

CORE has already been loaded by itself. When using the /U parameter, remember that TSRs must be removed in the reverse order of their loading order. This means you must first uninstall any TSRs activated after ENCORE.

The other three ENCORE parameters, /Kn, /Bn, and /P, can be invoked only when you're initially loading the program into memory. ENCORE's default buffer holds 100 keystrokes. If you exceed this maximum, the program will beep twice and stop recording. You can resize the keystroke buffer, however, by using the /Kn switch, where *n* is the number of keystrokes you want the buffer to hold. Because of the way ENCORE stores keystrokes (which we'll discuss later), each keystroke requires 5 bytes of buffer memory. Thus, entering

```
ENCORE /K1000
```

sets the keystroke buffer at 5,000 bytes, large enough to hold 1,000 keystrokes. The total RAM requirement for ENCORE.COM in this case would rise to approximately 6K.

If the tasks you want ENCORE to automate often involve entering long pathnames or multiple program switches, you'd soon find it tedious to watch the letters play back on the screen at the same speed you originally typed them. At the same time, certain pauses between keystrokes—to let a program load or a menu screen appear—must be preserved or command keystrokes would be lost. ENCORE solves this problem by providing a user-adjustable "boost" threshold, which is set

Utilities

with the `/Bn` switch when the program is loaded.

Keystrokes entered with less elapsed time between them than the threshold will be sped up when your recording is played back; they hit the screen at 18.2 characters per second—one per clock tick. If more than the threshold time value elapses between the keystrokes you record, however, your deliberate pauses will be preserved in their entirety.

You must decide the best boost value for your own use by experimentation, though the default of 1 second is a good starting point. You can change the boost threshold value with the command line switch `/Bn`, where *n* is the number of clock ticks. There are 18.2 clock ticks per second, so to change the boost value to 1.5 seconds you enter

```
ENCORE /B27
```

Note that `ENCORE /B0` sets the boost threshold to zero, which results in your keystroke sequences being replayed exactly at the pace you recorded them.

You can make your command line changes permanent by entering `/P` as a command line option. For example, entering

```
ENCORE /B9 /K500 /P
```

sets a boost threshold of .5 second, a buffer size of 500 keystrokes, and makes these the default values. Note that you must be in the subdirectory where `ENCORE.COM` resides in order for the `/P` switch to work.

ENCORE IN USE

It's a good idea to put `ENCORE` in a subdirectory on your path. That way, you can save a keystroke sequence to a file no matter where you are on your disk. If `ENCORE` isn't in a subdirectory on your path, then you'll have to return to the subdirectory where you keep it before you can save your keystroke file. Similarly, if you keep your `.ENC` files in the same directory as `ENCORE` (and you're using DOS 3.x) and you're in that directory or you specify the path for that directory, you'll be able to load them for replay from anywhere, with `Ctrl-P`. If you keep `ENCORE` in your `\UTIL` subdirectory, for example, you might save a keystroke series:

```
ENCORE /S \util\example
```

You don't have to play back a keystroke sequence immediately after loading it, of course. A sequence will remain in memory until you record another sequence, load another sequence, reboot, or turn off your computer. The same holds true for saving keystroke sequences. Until you reboot, load another sequence, record another sequence, or turn off your computer, you can save your recorded keystroke sequence at any time.

You will get an error message if you try to load an `ENCORE` file before the program itself has been loaded. The reason that `ENCORE` cannot simply load itself into memory and then load the file is part and parcel of a design decision to keep the program's memory-resident code as small as possible.

In order to minimize their size, most

ENCORE's boost threshold lets you play back keystrokes faster than you typed them, while preserving necessary pauses.

TSRs put all their initialization code at the end of the program. This part of their code is used only when the program is loaded as a TSR and never after the program is loaded. Therefore, in `ENCORE` all of the command line checking, all of the housekeeping associated with preparing `ENCORE` to become a TSR, and the load and save functions are located at the end of the program code. This way, once `ENCORE` has been loaded, the memory that originally holds its initialization code can be converted for reuse as `ENCORE`'s keystroke buffer.

If you use `ENCORE` in a windowing environment, you'll find that the utility works best if you load it separately in each window where you want to use it. Don't load `ENCORE` before loading your multitasker; if you do, an `ENCORE` playback sequence will continue in whatever window you switch to. Suppose you have a se-

quence you want to play back in window A. While the sequence is running, you decide to switch to window B. If `ENCORE` has been loaded in window A, then things should work fine. However, if you loaded `ENCORE` before loading your multitasker, then the playback will switch to window B the moment you do. This may produce interesting results, but they will definitely not be productive.

Note further that if you load `ENCORE` in each window where you want to use it, you can have different keystroke sequences being played back in each window concurrently. Or if you'd rather, you can have a keystroke sequence being replayed in a background window while you're working in another window.

LIMITS

There are some situations in which `ENCORE` cannot accurately record or play back your keystrokes. To understand these limitations, we need to discuss how your PC handles keystrokes.

BIOS interrupt 9 is called whenever you press or release a key. This interrupt grabs a value (the *hardware scan code*) from port 60h that indicates which key was pressed or released. Interrupt 9 keeps track of these keyboard actions and when it decides that something useful has happened, it creates 2 bytes (the *keyboard bytes*) of important data. One of these is the *ASCII byte*, which usually contains the ASCII value of the key being pressed. The other byte is referred to as the *software scan code* and is usually the same as the hardware scan code of the key being pressed. Notice, however, that I've twice used the word *usually*, for there are several variations on what these bytes contain. For more details on these bytes, the way your keyboard works, and the inner workings of interrupt 9, see the Lab Notes columns in our December 25, 1990, and January 15, 1991, issues.

Interrupt 9 also maintains two shift state bytes, 0040:0017 and 0040:0018. The byte at 0040:0017 indicates the state of CapsLock, NumLock, ScrollLock, and the status of the Ctrl, Alt, and Shift keys. It also tracks the Ins key as though it were a locking key. Almost no software uses this last piece of information, since—unlike all the other lock keys—the Ins key generates a keystroke in the buffer. The byte at 0040:0018 indicates whether Ins, CapsLock, NumLock, or ScrollLock are being held and whether the computer is paused with `Ctrl-NumLock`.

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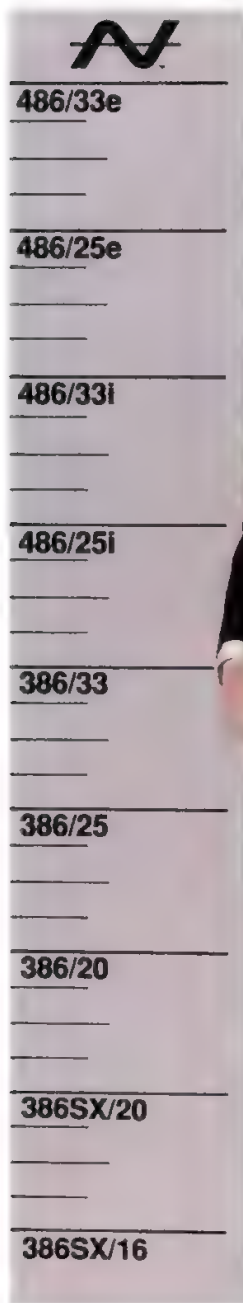
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Utilities

PC UTILITIES UPDATES

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. The only way to obtain the modified versions is to download them from PC MagNet. Here is a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ALIAS.COM, Version 1.1
ANSI.COM, Version 1.3
BAT2EXEC.COM, Version 1.3
BCOPY, Version 1.2
BEN55.ARC (Benchmark Series, Version 5.6)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.2
CMDEDIT.EXE, Version 2.01
CONFIG.CTL, Version 3.0
DIRMATCH.COM, Version 2.0
EMMA.COM, Version 2.2
EMS40.SYS, Version 1.1
LOG.COM, Version 1.1
MONO.COM, Version 1.1
PANDORA.COM, Version 1.5a
PCACCESS.COM, Version 1.1
PCMANAGE.EXE, Version 1.1
PCREMOTE.COM, Version 1.1
RN.COM, Version 2.0
SCHEDULE.COM, Version 1.1
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
TPFST-AT.COM, Version 1.1
ZCOPY.COM, Version 1.2

For a complete list of the programs available from the PC MagNet Utilities Database, download UDCAT.ARC.

A downloadable index to *PC Magazine*'s product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine Reviews Index* for January 1988 to June 1990. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any files.

These programs are copy-



Scott Chaney

ENCORE Command

April 16, 1991 (Utilities)

Purpose:

Records and plays back the keystroke sequences and intervening pauses needed to execute repetitive sets of menu choices or commands. Keystroke sequences can be saved and loaded as files or in memory, and playback is called by a hotkey.

Format:

ENCORE [/S] [/L] [/U] [/Kn../Bn../P]

Remarks:

ENCORE must initially be loaded (from the DOS command line or an AUTOEXEC.BAT file) without the /S, /L, or /U switch parameters. It then becomes a memory-resident (TSR) utility that uses Ctrl-R to start and stop recording a keystroke sequence and Ctrl-P to play it back. (Instructions for changing the default hotkeys are given in the original article.) One beep is sounded when a recording sequence is begun, and two beeps when it is terminated. Unmodified, ENCORE requires 1K of RAM.

The default 100-keystroke buffer can be changed by loading ENCORE with its optional /Kn switch, where *n* is the number of keystrokes to be saved. Each buffered keystroke requires 5 bytes of storage.

Entering ENCORE with its optional /Bn parameter changes the "boost" threshold used to distinguish between normal typing and deliberate pauses created to allow program loading, menu-screen changes, and the like. The default value of *n* is 18.2, the number of clock ticks equal to 1 second. Keystrokes entered more rapidly than one per second will be sped up on playback; longer pauses will be preserved in their entirety. Entering /B0 causes all keystrokes to be played back at the speed at which they were recorded. The optional /P parameter allows changes made with the /K and /B switches to be made permanent.

Recorded keystroke sequences can be saved to a file with the command **ENCORE /S filename**. The *filename* can have a path (so ENCORE and its key files can be kept in the same subdirectory) but no extension. The command **ENCORE /L filename**, again without extension, is used to load a saved key file. Subject to usual TSR limitations, the program can be uninstalled by entering the command

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Elegance 486/25i, Sept. 11, 1990
Elegance 486/33i, Feb. 12, 1991

PC Magazine then reviewed 486/25 ISA systems. "Only one machine stands out," they said, "you could pay less for a 486 system, but not get the bonuses that are offered with the Elegance."††



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CHANGING ENCORE'S HOTKEYS

Because of hotkey conflicts, you may want to change the default Ctrl-R and Ctrl-P hotkeys that are used by ENCORE for recording and playing back keystroke sequences. You can do this using DEBUG.

Before making any modifications, be sure to make a backup copy of ENCORE.COM, so that you won't lose the program if something goes wrong.

Two sets of changes are required: changes to the values for the hotkeys themselves and changes to the strings that show the designated hotkeys on-screen when you load the program.

CUSTOMIZING THE HOTKEYS

For each hotkey that you customize, you must change 2 bytes in the .COM file: the shift mask byte and the scan code byte. The shift mask byte controls which shifting key (Ctrl, Alt, Left Shift, Right Shift) is pressed simultaneously with a regular key to activate the record or playback function. (If you want to, you can use a combination of shifting keys together with an alphanu-

The 4 bytes that control the hotkeys are located at addresses starting with 107h in ENCORE.COM in the following order:

Current Value (in hex)

04 (Ctrl)	Record Shift Mask
13 (R)	Record Scan Code
04 (Ctrl)	Playback Shift Mask
19 (P)	Playback Scan Code

You can see this 4-byte sequence in the program by entering

```
debug encore.com
d107
```

To change the hotkey combinations, you must substitute other appropriate hex values for these defaults. Looking at Figures A and B, let us suppose you want to change the record hotkey to Alt-M and the playback hotkey to Alt-E. This would require the 4-byte sequence

```
08      (Alt)
32      (M)
08      (Alt)
12      (E)
```

To make these substitutions while still in DEBUG, simply enter

```
e107 08 32 08 12
```

Before saving these changes permanently, you will also want to modify the loading screen to reflect them. Each hotkey uses a 13-byte ASCII string to describe it, and you must be careful to enter the strings within quotes and to fill them out with spaces to a length of 13 characters. The record string starts at address 535h and the playback string at 557h. Therefore, in order, to make the screen descriptions match the changes above while still in DEBUG, you would enter

```
e535 "Alt-M"  -
e557 "Alt-E"  -
```

		SHIFT_MASK VALUE TABLE:																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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Figure A: To customize a hotkey you have to change the shift mask byte. This table lists the values of the shifting keys.

meric key, for example, Ctrl-Alt-M.) A table of the values for the shifting key(s) is shown in Figure A. The scan code byte controls which keystroke is to be pressed along with the shifting key(s). A table of the PC's scan codes is shown in Figure B.

PC MAGAZINE KEYBOARD SCAN CODES FOR ALTERNATIVE HOTKEYS

Key	Scan Code in Hex	Key	Scan Code in Hex
Esc	01	Z	2C
!1	02	X	2D
@2	03	C	2E
#3	04	V	2F
\$4	05	B	30
%5	06	N	31
^6	07	M	32
&7	08	<.	33
*8	09	>.	34
(9	0A	?/	35
)0	0B	Right Shift	36
-	0C	PrtScn*	37
+ =	0D	Alt	38
Backspace	0E	Spacebar	39
Tab	0F	CapsLock	3A
Q	10	F1	3B
W	11	F2	3C
E	12	F3	3D
R	13	F4	3E
T	14	F5	3F
Y	15	F6	40
U	16	F7	41
I	17	F8	42
O	18	F9	43
P	19	F10	44
[	1A	NumLock	45
]	1B	ScrollLock	46
Enter	1C	7 Home	47
Ctrl	1D	8 Up Arrow	48
A	1E	9 PgUp	49
S	1F	-	4A
D	20	4 Left Arrow	4B
F	21	5	4C
G	22	6 Right Arrow	4D
H	23	+	4E
J	24	1 End	4F
K	25	2 DownArrow	50
L	26	3 PgDn	51
::	27	0 Ins	52
...	28	. Del	53
~, Left Shift	29	SysReq	54
	2A	F11	57
	2B	F12	58

Figure B: The table above shows the different hex values of the scan codes. The scan code byte must also be changed before you can customize a hotkey.

All that is left is to write these changes in the hotkeys and in their description strings to disk and quit DEBUG. You do this simply by entering

```
w
q
```

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Utilities

The byte at 0040:0017 is important because it lets a program know which shift-state combinations were in effect when the key was pressed. A scan code of 30, for example, indicates the A key was pressed, but is it Ctrl-A, Shift-A, Alt-A, Ctrl-Shift-A, or just a normal old A? The shift-state byte tells us.

All of these bytes are stored where programs like ENCORE can access them. And because the BIOS keeps the ASCII and software scan code bytes in a circular buffer, we can easily tell when new information has been added. And that's exactly what ENCORE does. Every time interrupt 9 is called, it checks to see whether any new information has been added to the buffer. If it has, ENCORE stores the new information in its own buffer. During playback, ENCORE stuffs the information it has saved back into the BIOS variables. The host program (or BIOS), noting that new information is in there, assumes the keyboard put it there.

What if a program doesn't wait for interrupt 9 to make sense of all the keystrokes, but instead reads port 60h each time a key is pressed and acts directly upon the hardware scan code? Then, frankly, ENCORE won't work. You're likely to run into situations like this during games and when TSRs are activated—places where direct keyboard intervention is important. If you use *Windows*, you'll find that while ENCORE works fine inside a window, it doesn't work while the program manager is active. The program manager doesn't want anyone interfering with its operation.

An apparent solution, of course, would be to grab the port 60h values each time interrupt 9 is called and then, during playback, stuff the value back into port 60h and generate an interrupt 9 just as the keyboard controller does. Unfortunately, however, this is not possible on a PC or XT. And though it's supposedly possible on ATs and PS/2s, I haven't had any luck doing it using my own keyboard, suggesting that it may be machine-specific.

ENCORE must also assume that programs that change the interrupt 9 vector chain to the original vector. However, there are still a few programs that will take over interrupts without chaining to the old interrupts. These misbehaved programs will disable all TSRs—including EN-

CORE. Their intent is to keep all other programs from interfering with their getting the information they want.

Fortunately, however, most programs today either do not tangle with interrupt 9, or if they do, they chain to the previous interrupt 9 vector. In these situations ENCORE works just fine.

PROGRAMMING CONSIDERATIONS

For most purposes, the discussion of capturing and playing back the keystrokes already presented will suffice. But for pro-

**The reason that
ENCORE cannot
simply load itself into
memory and then load
the file is part and
parcel of a design
decision to keep the
program's memory-
resident code as small
as possible.**

gramming purposes, I should go into a little more detail.

ENCORE taps into interrupt 9 for several reasons. First, it checks the scan-code value at port 60h to see whether one of ENCORE's hotkeys has been pressed. If a key has been pressed, then interrupt 9 checks the shift state to make sure the hotkey combination is correct. (You don't want the program to act on Alt-R if Ctrl-R is the desired hotkey!) If there's a match, then the hotkey function is initiated. At this point we also tell the keyboard to act as though no key were pressed so that the hotkey doesn't become part of an ordinary file. We do this by sending the keyboard a reset command and returning from interrupt 9 without chaining to the original interrupt 9 (that is, to the interrupt 9 vector, in effect, when we loaded ENCORE). In addition we set a flag so that the hotkey release is also intercepted and removed.

One note about the addressing of the

BIOS data area is in order. As programming veterans know, a byte in this area can be reached using any segment between 0 and 40h. For example, the byte at 0040:001C can also be expressed as 0000:041C, or simply as 41Ch, the 0 segment being assumed. When referring to data in the BIOS area, however, I will always refer to it using the actual segment address of 40h, because the location of the head and tail of the keyboard buffer assume this offset.

ENCORE also uses interrupt 9 while recording a key sequence. First, we chain to the original interrupt 9. Then, after interrupt 9 has had its chance to make sense of the keypress or release, we check BIOS variable 0040:001C to see whether the tail of the keyboard buffer has changed. If it has, we grab the ASCII and software scan code bytes from the BIOS keyboard buffer, the shift state value in 0040:0017, and store all three of these values in ENCORE's buffer.

To determine the delay between keystrokes, ENCORE resets a counter whenever keystroke data is saved and increments the counter every clock tick (18.2 times a second) until the next key's data arrives. We do this by tying into interrupt 1Ch, which is generated by the hardware clock tick and is used for a variety of functions, including disk drive time-out and updating the system clock.

ENCORE allocates 2 bytes per keystroke for the delay. This allows for a delay between keystrokes of up to one hour. If you've been adding it up, you'll see that each keystroke takes up 5 bytes of data in ENCORE's buffer: 1 byte each for the ASCII value, scan code, shift state, and 2 bytes for the delay.

When you replay a key sequence, the process is simply reversed. ENCORE waits until the desired number of clock ticks has elapsed and then shoves the keystroke data into the BIOS variables and adjusts the end of the keyboard buffer value at 0040:001A to reflect the additions. This action fools almost everything (including BIOS interrupt 16h functions) into thinking that a key has been pressed. Simple but effective.

When a keystroke sequence is recorded, the size of the keystroke data is put in the StrBytes variable, which is located directly before the keystroke buffer. When we save a keystroke sequence to disk, we save the data from the StrBytes variable to the end of the keystroke data. That way, when reloading a sequence from disk, EN-

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Utilities

CORE can read the first word of the file, know the keystroke sequence size, and read it into memory.

However, before we can start saving or loading keystroke sequences to and from disk, we must have some way of checking to determine whether or not ENCORE is already loaded in memory. We can do this by sequentially checking each segment of memory to see if our check message is located where it should be. However, before we start to search through the segments, we must first change the check message slightly so that we won't find a match in a disk cache. We start the search at segment A000h and wrap around to low memory. In this way, we will be able to catch ENCORE in the event that it's been loaded into high memory. We now have an effective way to check whether or not ENCORE is loaded in memory.

Storing the offsets of important ENCORE variables right after the check message gives the program a convenient means of transferring data between EN-

CORE and disk. To make this a little clearer, let's follow the sequence of events as we attempt to load a key sequence from disk into ENCORE.

As explained above, it first checks each

**Whether your interests
are those of a user
or a programmer,
remember ENCORE
the next time you find
yourself performing
the same job again
and again.**

segment for ENCORE's check message. If there's a match, it continues to read two words beyond the ENCORE message.

This data contains the offsets of the buffer and the buffer size variable. ENCORE uses the offset of the buffer size variable to check the buffer size against the first word in the keystroke file, to make sure the keystroke sequence will fit within the ENCORE buffer. If the buffer size is sufficient, the rest of the sequence is loaded directly from disk into ENCORE's buffer, where it waits patiently for you to press the playback hotkey. It's very important that ENCORE checks the buffer size first. If it didn't, a keystroke sequence longer than the buffer size would overwrite memory not allocated to ENCORE, and as every programmer knows, that's a sure-fire recipe for disaster.

In any case, whether your interests are those of a user or a programmer, remember ENCORE next time you find yourself performing the same job again and again. Your PC will love it, and you won't have to waste human talent on a thoughtless task. ■

Scott Chaney is the founder of RSE, a company in Auburn, Washington, that specializes in the development of productivity shareware for PCs.

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You can find FILMAN.ZIP in DL2 of our UTILFORUM (GO PCM:UTILFORUM). It must be uncompressed with an unzip utility such as UNZIP2.COM or PKZ110.EXE (available in DL16).

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A few months ago, we mentioned TAPCIS as a quick and money-saving way to automate on-line procedures such as electronic mail and forum messaging on CompuServe (see PC MagNet News, 1/29/91). There is a

similarly featured CompuServe front end that can be used for these on-line chores; it's called AUTOSIG. Made available free of charge by our Sysop friends of the IBMCOMM forum, this package minimizes on-line connect time, thus saving you money while increasing productivity.

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by
Charles Petzold

Environments

In recent columns, we've seen how video boards that support palette manipulation contain a palette lookup table on the board that maps pixel-bit values (the bits stored in video memory for each pixel) to RGB (red-green-blue) color values. These RGB values are then sent to the video monitor to display the pixels.

Last time, I showed you how to use the new palette manager in *Microsoft Windows 3.0* to perform a type of animation known as *palette animation*. A program that uses palette animation begins by drawing images into video memory. The program then manipulates the palette table to change the image's appearance. Because these changes don't involve redrawing, palette animation is very fast.

The *Windows* palette manager allows a program to perform this palette manipulation in a device-independent manner without directly accessing video board hardware. You need just one function call (`AnimatePalette`) to change the palette to perform the animation. Currently, the only *Windows* device drivers that support palette manipulation are those for video boards capable of displaying more than 16 simultaneous colors in the resolution used by *Windows*. This excludes the EGA and standard VGA, but includes the IBM 8514/A (and compatibles) and some Super VGA boards.

The *BOUNCE* program I described in the last issue used palette animation to display a bouncing ball. That was a rather unorthodox use of palette animation. In this column, I'll describe four additional programs that use palette animation in more-typical ways. Only the first of these programs—*FADER*—is shown in this column (see Figures 1 through 3); the other programs can be downloaded from PC MagNet.

If you have the *Windows 3.0* Software Development Kit and the Microsoft C 6.0 Compiler installed, you can create *FADER.EXE* by executing

MAKE FADER.MAK

Palette Animation Techniques Under Windows 3.0

■ One of the more intriguing aspects of palette animation is that you can implement some interesting techniques using only one palette entry.

Of course, all the source code and *FADER.EXE* can be downloaded from PC MagNet.

FADING TEXT

One of the more intriguing aspects of palette animation is that you can implement some interesting techniques using only one palette entry. This is illustrated in the *FADER* program.

FADER displays the text string "Fade In And Out" all over its client area. First, this text is displayed in white and appears invisible against the white background of the window. *FADER* uses palette animation to gradually change the color of the

text to blue and then back to white, over and over again. The text appears as if it's fading in and out. Figure 4 shows *FADER* about halfway through the fade.

This technique can add a professional-looking touch to the display of titles and other information in an application. Of course, you probably don't want to use such a gimmick in a word processing or spreadsheet application—users would get annoyed waiting for the text to fade out. But in presentation, training, or entertainment software, it's ideal.

INSIDE FADER.C

As in the *BOUNCE* program, the `WndProc` window procedure in *FADER* checks for palette support when processing the `WM_CREATE` message. The program obtains a device context for the window by calling `GetDC`, then calls `GetDeviceCaps` with the `RASTERCAPS` parameter. If the return value has the `RC_PALETTE` flag set, then the video device driver supports palette manipulation.

FADER also calls `GetDeviceCaps` with the `SIZEPALETTE` and `NUMRESERVED` parameters to check whether the size of

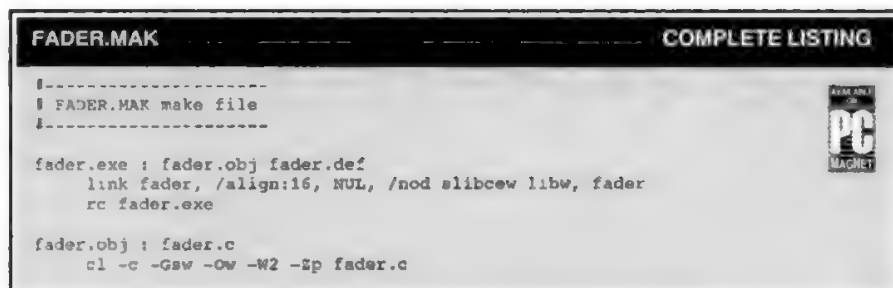


Figure 1: This file automates construction of the *FADER.EXE* executable.

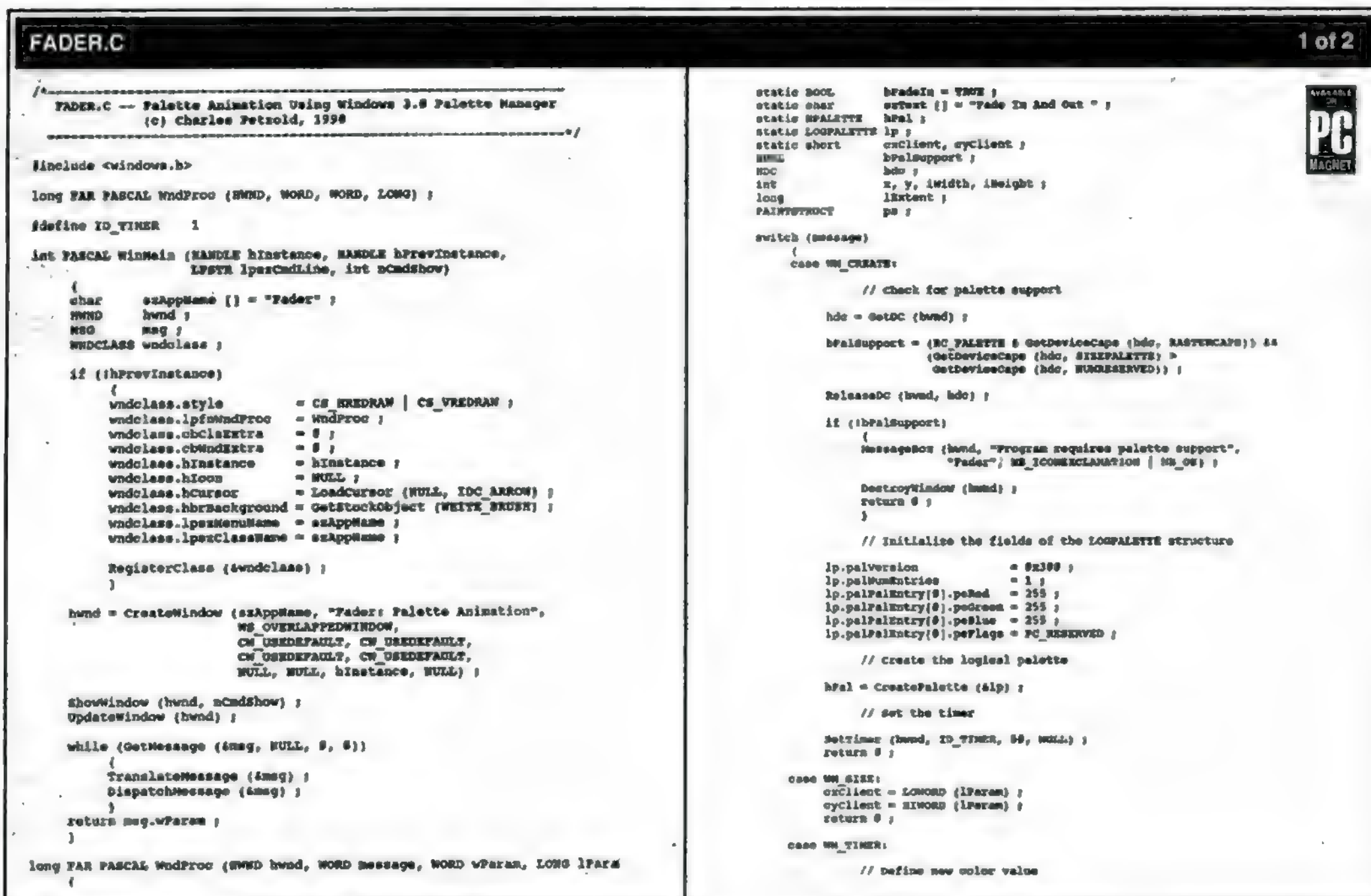


Figure 2: Here's the source code listing for the FADER program.

the palette (which is the same as the number of simultaneous colors the video adapter can display) is greater than the number of colors in the palette reserved by *Windows*. In the case of the IBM 8514/A adapter, these two values are 256 and 20.

It's not clear yet whether this second check is necessary. That depends on how palette support will be implemented in forthcoming enhanced drivers for the standard VGA. Palette support may be implemented by reserving only 8 colors of the 16, or by reserving all 16 colors and requiring the application to use *SetSystemPaletteUse* to get access to the reserved palette entries.

In FADER, the program terminates if the video driver doesn't support palette manipulation. In a real-life application, you'd want to use a different approach (for example, not fading the text at all) if palette manipulation isn't available.

FADER next creates a logical palette. It needs just one of the palette's entries and initializes the color to white (that is, red, green, and blue values are all set to

255). Note that the *peFlags* field of the *PALETTEENTRY* structure within the *LOGPALETTE* structure is set to *PC_RESERVED*, indicating that the en-

ally get a *WM_TIMER* message every 55 milliseconds, which is about 18.2 times a second.

Let's skip down to *WM_PAINT* processing. FADER selects the palette into the device context, realizes it, and calls *SetTextColor* to set the text color to *PALETTEINDEX(0)*. This means that the text color is set to the first entry in the palette table, which initially is white. FADER then fills up its client area with the "Fade In And Out" text string.

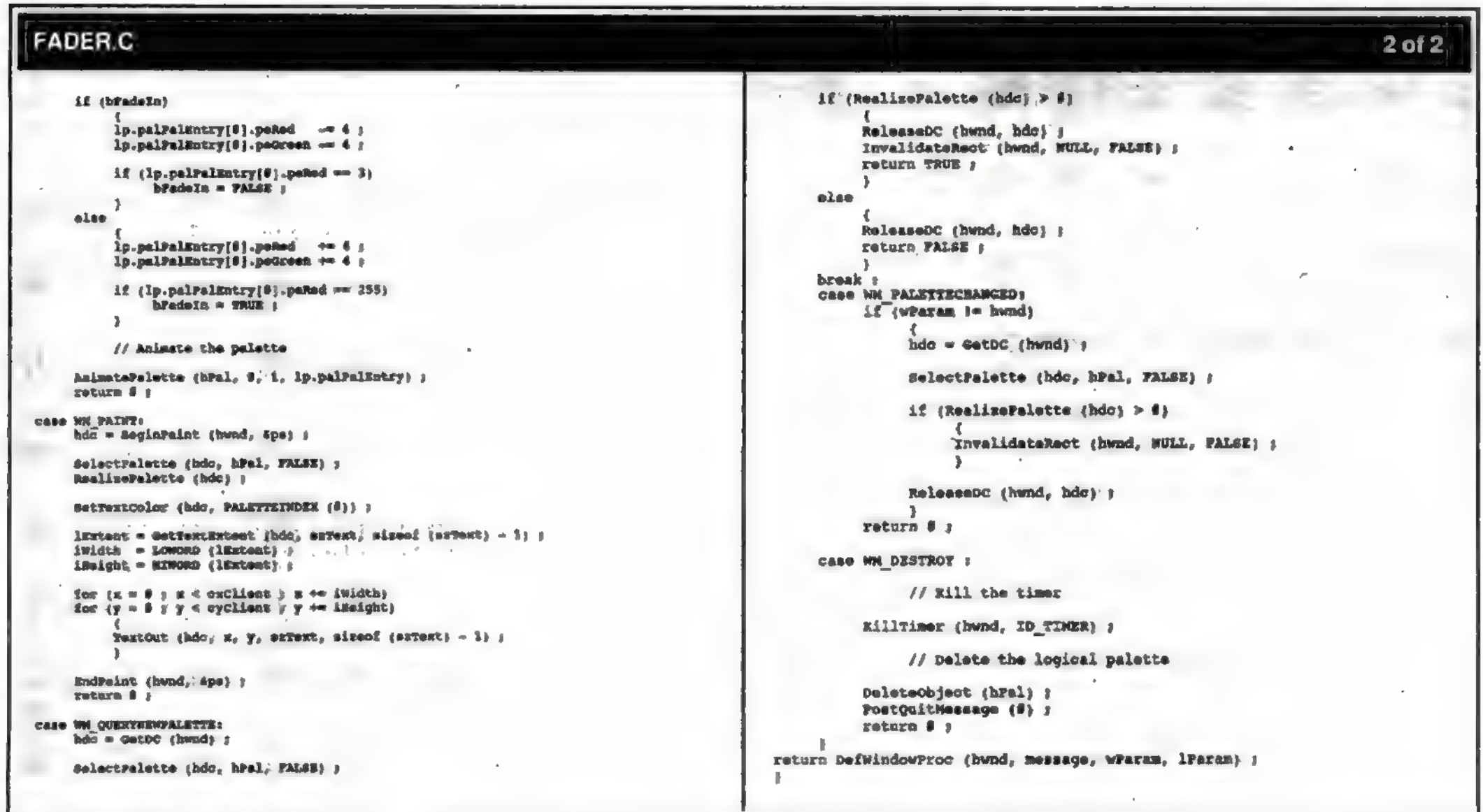
At this point, the window background is white and the text is white, so the text is invisible.

During the *WM_TIMER* message, FADER animates the palette by altering the *PALETTEENTRY* structure and passing it to *AnimatePalette*. The program first decrements the red and green values by 4 for each *WM_TIMER* message until they reach a value of 3. Then the values are incremented by 4 until they get back up to 255. This causes the color of the text to fade from white to blue and back to white again.

Palette management exists to solve a basic problem: Video boards using 8 bits per pixel are capable of only 256 simultaneous colors.

try will be used for palette animation.

FADER concludes *WM_CREATE* processing by setting a 50-millisecond timer. Because the *Windows* timer is limited by the system clock, FADER will actu-



DISPLAYING ALL THE COLORS

After I wrote FADER, I realized I could write another program—again using only one palette entry—to display all of the colors that the video adapter can render. Of course, you won't see all 262,144 colors on the IBM 8514/A simultaneously—you'll see them one at time, changing every 55 milliseconds. Even at that fast rate, you'd have to spend 4 hours staring at the screen to see all the colors!

The program is called ALLCOLOR, and structurally it's very similar to FADER. During the WM_CREATE message, ALLCOLOR creates a palette with only one palette entry. The color is set to black (the red, green, and blue fields of the PALETTEENTRY structure set to 0). During the WM_PAINT message, ALLCOLOR selects the palette into the device context, realizes it, creates a solid brush using PALETTEINDEX(0), and calls FillRect to color the entire client area with that brush.

During the WM_TIMER message, ALLCOLOR animates the palette by changing the PALETTEENTRY color and calling AnimatePalette. I wrote ALLCOLOR so that the change in color is smooth. First, the blue value is progressively incremented. When it gets to the maximum, the green value is incremented, and then

the blue value is progressively decremented. Some of the code I used in the WM_TIMER message is shown in Figure 5. The variable **pe** is a PALETTEENTRY structure, and the BOOL values **bBlueUp**, **bGreenUp**, and **bRedUp** are initialized to TRUE.

The incrementing and decrementing of the red, green, and blue color values is based on the **iIncr** variable. Originally, I wrote ALLCOLOR so that the red, green, and blue values were incremented and decremented by a value of 1. If you take the time to work out the math, you'll find that the original version of ALLCOLOR would require 10 days to display all 16 million colors! (I think that's my record.)

Incrementing and decrementing by 1

is overkill, because the color resolution of the IBM 8514/A isn't good enough to display 16 million colors. The 8514/A palette table uses 6 bits each for the red, green, and blue color values and hence is capable of rendering only 262,144 (2^{18}) discrete colors.

Fortunately, GetDeviceCaps with the COLORRES parameter returns the color resolution of the video display. ALLCOLOR calculates **iIncr** during the WM_CREATE message using the following formula:

```
iIncr = 1 << (8 - GetDeviceCaps
(hdc, COLORRES) / 3) ;
```

For the 8514/A, GetDeviceCaps with the COLORRES parameter returns 18. This

FADER.DEF

COMPLETE LISTING

```
;------;
; FADER.DEF module definition file
;------;
```

NAME	FADER
DESCRIPTION	'Palette Animation (c) Charles Petzold, 1998'
EXETYPE	WINDOWS
STUB	'WINTUB.EXE'
CODE	PRELOAD MOVEABLE DISCARDABLE
DATA	PRELOAD MOVEABLE MULTIPLE
HEAPSIZE	1024
STACKSIZE	8192
EXPORTS	WndProc

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Figure 3: This is FADER's module-definition file.

Environments

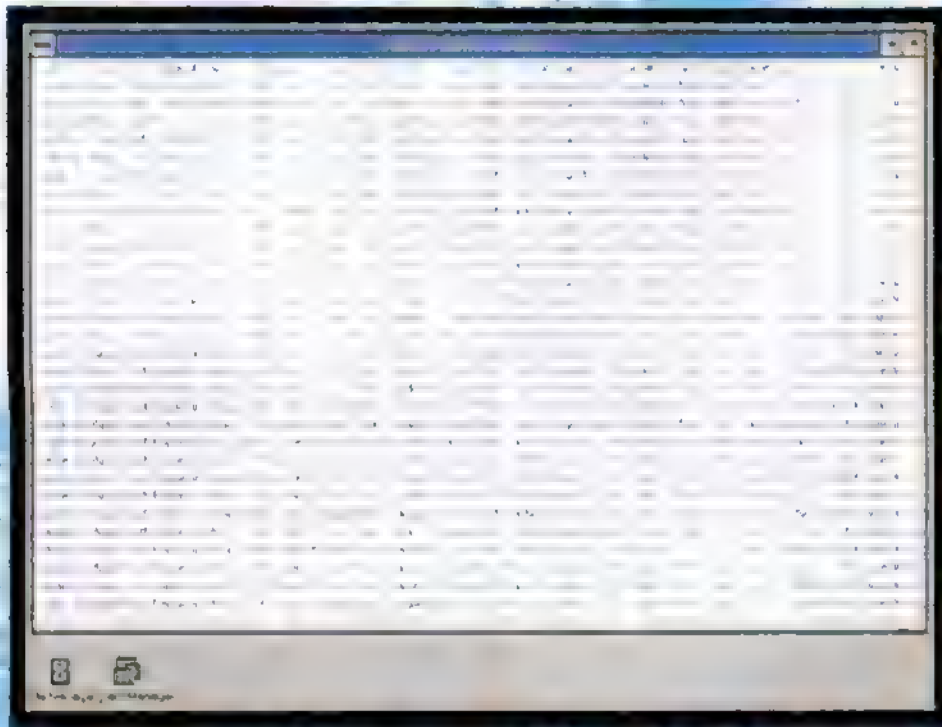


Figure 4: The FADER program running on an 8514/A under Windows 3.0.

is divided by 3 (yielding 6) and then subtracted from 8, yielding 2. This is used to shift 1 left, yielding 4. Thus, the red, green, and blue color values are incremented and decremented by 4—the lowest value necessary to obtain all the colors. (For a video board with a color resolution of 15—5 bits each for red, green, and blue—the `iIncr` value would be 8.)

ALLCOLOR also displays the current RGB color value in the upper-left corner of the client area. I originally added this code for testing purposes, but it proved to be useful and interesting, so I decided to leave it in.

AN ENGINEERING APPLICATION

Earlier I mentioned that text-fading was most appropriate for presentation, training, or entertainment software. Unfortunately, there are still many people who feel that animation is appropriate only for these peripheral applications and not for people who really need to get work done.

This isn't necessarily true. In engineering applications, animation can be very useful for the display of mechanical or electrical processes. It's one thing to simply display a combustion engine on a computer screen, but animation can really make it come alive and show its workings with much greater clarity.

During a conference on multimedia I attended in November, I saw a program that used palette animation to show fluids passing through a pipe. This is an area where the image doesn't have to be strictly

accurate—in fact, if the image were accurate (as if you were looking at a transparent pipe) it might be difficult to tell how the contents of the pipe were moving. In this instance, it's better to take a more symbolic approach.

The PIPES program is a very simple demonstration of this technique. Two horizontal pipes are displayed in the client area. The contents of the pipes move from left to right in the top pipe, and from right to left in the bottom pipe. Figure 6 shows PIPES running on an 8514/A.

PIPES uses 16 palette entries for the animation, but you could probably get by with fewer. All you really need are enough entries to show the direction of the flow. Even three palette entries would be better than a static arrow.

GOING THROUGH THE TUNNEL

The TUNNEL program is the piggiest program of this batch, using 128 palette entries for animation. But the effect is worth it.

TUNNEL uses 64 moving gray shades in the 128 palette entries—from black to white and back to black—to give the effect of traveling through a tunnel. Figure 7 shows a typical view. A brief note of caution: Prolonged viewing of TUNNEL may result in giddiness, a sudden interest in beads and paisley shirts, and a yearning to move to a commune in Wisconsin.

24-BIT COLOR VIDEO BOARDS

Palette management exists to solve a basic problem: Video boards using 8 bits per pixel are capable of only 256 simultaneous colors, and these colors may not be the most suitable for a particular application. The palette manager gives the application the opportunity to choose the 256 colors it wants. Palette animation is a freebie, as far as hardware is concerned.

A better solution to the 256-color problem is really quite simple—rather than use a video board that stores 8 bits per pixel, use one that stores 24 bits per pixel. The 24 bits allow the board to simultaneously

ALLCOLOR'S WM_TIMER ROUTINE

```
case WM_TIMER:
    // Define new color value
    pe.peBlue += (bBlueUp ? iIncr : -iIncr);
    if (pe.peBlue == (bBlueUp ? 0 : 256 - iIncr))
    {
        pe.peBlue = (bBlueUp ? 256 - iIncr : 0);
        bBlueUp ^= TRUE;
        pe.peGreen += (bGreenUp ? iIncr : -iIncr);
        if (pe.peGreen == (bGreenUp ? 0 : 256 - iIncr))
        {
            pe.peGreen = (bGreenUp ? 256 - iIncr : 0);
            bGreenUp ^= TRUE;
            pe.peRed += (bRedUp ? iIncr : -iIncr);
            if (pe.peRed == (bRedUp ? 0 : 256 - iIncr))
            {
                pe.peRed = (bRedUp ? 256 - iIncr : 0);
                bRedUp ^= TRUE;
            }
        }
    }
    // Animate the palette
    AnimatePalette (hPal, 0, 1, &pe);
```

Figure 5: Partial processing of the WM_TIMER message in ALLCOLOR.

Environments

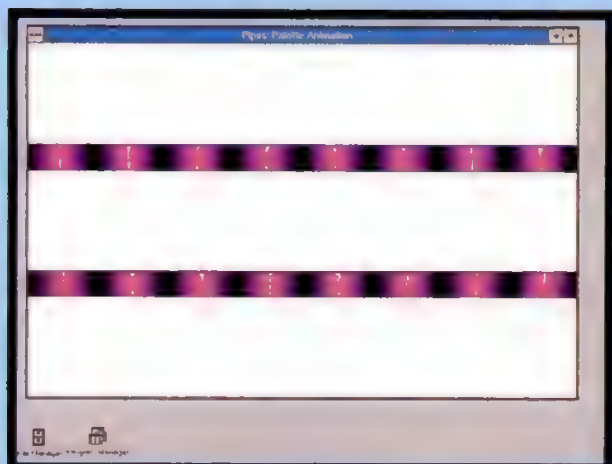
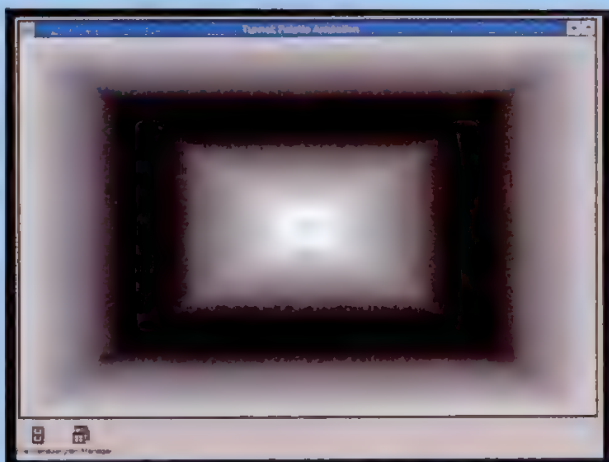


Figure 6: The PIPES program running on an 8514/A under Windows 3.0.

Figure 7: The TUNNEL program running on an 8514/A under Windows 3.0.



display the full range of 16 million colors. In this case, you don't need a palette manager at all.

There are some 24-bit color boards out there already, and they're likely to become more popular in the years ahead. The problem is not memory. The resolution of the 8514/A board is 1,024 by 768, with 1 byte per pixel. That's 768K of video board memory. (The 8514/A actually uses a megabyte.) A 24-bit video board would require only three times as much memory—3MB, for example. That's quite reasonable. The problem is performance. When a video board uses 3 bytes per pixel, some kind of hardware drawing assistance is required to achieve adequate performance.

However, it's unlikely that a 24-bit

video board would contain a palette lookup table. With 16 million possible pixel bits, a palette lookup table would require enough memory so that each of these maps to a 24-bit RGB color value. That's a whopping 48 megabytes of memory—and that is certainly unreasonable for a video board at this time.

The implication is that palette animation is probably a short-lived technique, possibly to be revived when 48 megabytes of memory on a video board is not a big deal. So, to keep your code device-independent and able to adapt to video adapters of the future easily, you'll probably want to keep your use of palette animation to a minimum and use different coding techniques for video boards that don't support palette manipulation. ■

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by
Ray Duncan

Power Programming

An Introduction to Dynamic Data Exchange In Windows 3.0

Technological excellence may earn awards and admiring reviews for a product, but the destiny of that product in the marketplace depends on other factors entirely. It's hard to think of a more striking illustration of this principle than the respective fates of OS/2 and *Microsoft Windows*. OS/2 was designed for multitasking and protected mode from the ground up. It supports a sophisticated graphics engine and high-performance file system that puts most other operating systems to shame—and it's struggling to survive. At the same time, *Windows 3.0*, which is based on an outdated graphics engine and coexists uneasily with a single-tasking real-mode operating system, is selling over 100,000 copies per month.

From a purely pragmatic point of view, the marketplace has made its choice, and developers must follow the market. But for those of us who have worked with OS/2 for several years, the prospect of refocusing our development efforts on the far weaker *Windows* platform is deeply discouraging. *Windows*' Dynamic Data Exchange (DDE) facility, discussed in this column, is a glaring example of this weakness. While OS/2 is exceptionally rich in interprocess communication mechanisms, *Windows* is exceptionally impoverished. OS/2 supports semaphores, named and anonymous pipes, named shared memory segments, queues, signals, mailslots, the clipboard, and a rather well-thought-out DDE interface. *Windows* offers only the Clipboard (which requires the active participation of the user), passage of data via custom dynamic link libraries, and an incredibly primitive, arcane, and clumsy DDE protocol.

In truth it's only been possible for a relatively short time to say that *Windows* DDE *does* have a protocol. During the earliest years of *Windows*, DDE was a mysterious black box that was regarded by *Windows* programmers with considerable fear and trembling. Microsoft's documentation of DDE was nearly nonexistent, and such documentation as could

■ Despite the weaknesses of DDE under *Windows 3.0*, you can play some interesting games with the *Windows* desktop if you've got any DDE-capable applications.

be found was obscure and confusing. The first edition of Charles Petzold's *Programming Windows*, regarded by many as the only comprehensible and comprehensive resource on the subject, didn't discuss DDE at all. The situation was so bad that after *Microsoft Excel* for *Win-*

dows was released, it became a purely empirical standard for DDE; programmers said that "DDE is what *Excel* does" and wrote their applications accordingly.

Developers who are just now turning their attention to *Windows* are somewhat luckier. The official Microsoft *Windows* programming manuals have been updated to encompass a very lucid and thorough explanation of DDE, and the second edition of Petzold's book has an entire chapter on the subject. Better yet, *Excel* is no longer the only major, readily available application that fully supports DDE. Very interesting things can be done with DDE using Microsoft's *Word for Windows*, Borland's *ObjectVision*, Asymetrix's *ToolBook*, or Whitewater Group's *Actor*. Although *Windows* DDE is fundamentally klunky,

THE NINE DDE MESSAGES DEFINED FOR WINDOWS	
WM_DDE_ACK	Sent in positive or negative acknowledgement of a received message.
WM_DDE_ADVISE	Requests the server to supply an update or notification for a data item whenever it changes.
WM_DDE_DATA	Sends a data item value to a client.
WM_DDE_EXECUTE	Sends a command string to the server application.
WM_DDE_INITIATE	Initiates a conversation between a DDE client and server.
WM_DDE_POKE	Sends a data item value to a server.
WM_DDE_REQUEST	Requests a particular data item from the server.
WM_DDE_TERMINATE	Terminates a DDE conversation.
WM_DDE_UNADVISE	Terminates a data link that was previously established with WM_DDE_ADVISE.

Figure 1: Applications implement DDE by means of *Windows*' global memory blocks, global atoms, and these nine DDE-specific messages passed from one program to another via ordinary *Windows* message functions and message queues.

Power Programming

it's worth your time to learn something about it, because it will apparently form the basis of Microsoft's much-touted "Object Linking and Embedding" (OLE).

BASIC FACTS OF DDE

In Microsoft terminology, a DDE transaction between two *Windows* applications is called a *conversation*, and it relies completely on the *Windows* message mechanism. A particular conversation is uniquely identified within the system by the window handles of the two participants, so non-*Windows* applications cannot use DDE even if they are running under the control of *Windows* (for example, in a *Windows* "DOS box"). The program that initiates a DDE transaction is called the *client*, while the program that responds to the request is called the *server*. Any given program can participate in many DDE conversations at a time, possibly acting as a server in some of the conversations and as a client in others.

There are three types of elements in DDE conversations: *items*, *topics*, and *application names*. The application name is usually the program name of the server, such as *Excel*. The topic name is typically a filename that identifies the data set to be operated on. The application name and topic define, in effect, the participants and context of a DDE conversation, and thus do not change during a conversation. An item is a chunk of information that's exchanged between the client and server; it may be the name or coordinates for a particular piece of data that the client or server wishes to inspect or modify, or it may be the data itself.

Now we come to the sticky part. *Windows*' involvement in DDE is essentially passive. Applications implement DDE by means of *Windows*' global memory blocks, global atoms, and nine DDE-specific messages (see Figure 1) that are passed from one program to another via ordinary *Windows* message functions and queues—but *Windows* does not constrain, validate, or define in any way the format of DDE items passed from one program to another. Consequently, the content of a conversation is totally server-specific, and there is no way to predict the form that the conversation might take. In other words, establishing a successful DDE

transaction always requires programming that's idiosyncratic to both the client and the server. What a mess!

For those of you who aren't familiar with *Windows* terminology, *global memory blocks* are those allocated from the system's memory pool and are represented by a handle. When the application needs to access the contents of the block, it asks *Windows* to lock the block, and *Windows* returns a far pointer to the block. Global memory blocks used in DDE are allocated with a GMEM_DDESHARE flag that allows them to be accessed by more than one program.

A *global atom* is somewhat like a global memory block in that it resides in system-controlled memory and is represented by a handle, but its contents are always an ASCII string. You can use the atom's handle to retrieve the string, or you can ask *Windows* to search all the global atoms

to match a particular string and (if a match is found) return the corresponding atom handle.

Let's look in more detail at the steps in a simple DDE conversation:

- The client creates two global atoms containing the name of the server and the name of the topic. If either or both of the strings are null strings, they are considered wildcards.
- The client broadcasts a WM_DDE_INITIATE message to all open windows, passing in the message its window handle and the handles for the server and topic name atoms.
- If another application recognizes the WM_DDE_INITIATE message and can function as a server for the conversation, it in turn creates global atoms for its server and topic names, and sends the handles for these—along with its own window handle—back to the client in a



FORMATS FOR THE PROGRAM MANAGER COMMAND STRINGS

AddItem(CmdLine{,Name{,IconPath{,IconIndex{,xPos,yPos}}}))

Adds a program and its icon to an existing Program Manager group. The CmdLine parameter is the command line that will be used to execute the program. The Name is the text that will be displayed under the icon. The IconPath gives the name of the file that contains the icon to be used, while the IconIndex indicates which icon within the file to use if there is more than one. The xPos and yPos parameters specify the relative position of the icon within the group's window.

CreateGroup(GroupName{,GroupPath})

Creates a new Program Manager group or activates (brings to the foreground) an existing group. The optional GroupPath specifies a file that contains group information; if this parameter is not supplied, *Windows* uses a default filename for the group in the *Windows* directory.

DeleteGroup(GroupName)

Deletes the specified group from the Program Manager menus and display.

ExitProgMan(flag)

Instructs the Program Manager to exit. The flag is true if the Program Manager should save its current state and any changes that were made since its last invocation; otherwise, it's false.

ShowGroup(GroupName,ShowCommand)

Controls the appearance of a specific Program Manager group, according to the value of the ShowCommand parameter. The possible values of ShowCommand are as follows:

- 1—Activates and displays the group window. If the window is iconized or minimized, *Windows* restores it to its original size and position.
- 2—Activates the group window and displays it in iconic form.
- 3—Activates the group window and displays it maximized.
- 4—Displays the group window in its most recent size and position, but doesn't change the active window.
- 5—Activates the group window and displays it in its current size and position.
- 6—Minimizes the group window.
- 7—Displays the group window as iconic, but doesn't change the active window.
- 8—Displays the group window in its current state but doesn't change the active window.

Figure 2: Command strings that can be processed by the *Windows* 3.0 Program Manager. Each complete command must be enclosed in square brackets (not shown). Fields shown in curly brackets are optional. The application and topic names for the DDE conversation are "PROGMAN." The command strings are sent in WM_DDE_EXECUTE messages.

Power Programming

WM_DDE_ACK message. At this point client and server know each others' window handles and can delete the global atoms they created for server and topic names.

- The client creates a global atom whose string identifies a data item and then sends the atom handle and a code specifying the desired data format to the server, in a WM_DDE_REQUEST message.

- If the server can satisfy the request, it allocates and locks a global memory block, places the data in the block, and unlocks the block. It then creates a global atom with the data name and returns the handles for the atom and the data block to the client in a WM_DDE_DATA message.

- The client locks the global data block, retrieves the data, and unlocks the block again. The client may then send a WM_DDE_ACK message to the server indicating that it processed the message and/or deleted the global data block, depending on flags in the server's WM_DDE_DATA message.

- The last three steps above are repeated as many times as necessary.

- The client sends a WM_DDE_TERMINATE message to the server, indicating that it wants to end the DDE conversation, and the server acknowledges by echoing the same message back to the client. The server may then perform a final exit.

What if the server isn't already running when the WM_DDE_INITIATE message is broadcast by the client? *Windows* plays a rather clever trick here. The client's SendMessage of WM_DDE_INITIATE will not complete until all destination windows have processed the message and any WM_DDE_ACK replies have been in turn processed by the client. So, if no replies have been received when the SendMessage function call returns, the client knows that no server is available, and it can use the WinExec function to launch a potential server, and then try again to start up a DDE conversation by broadcasting WM_DDE_INITIATE.

PLAYING WITH DDE

The explanation I've just given is sketchy, and it ignores the subtle features of more-complex DDE transactions such as warm and hot links, but it should provide a rough idea of how many places there are for things to go wrong with an asynchronous, multistep protocol of this type. At any rate, those of you who don't program in C can forget most of this trivia. Higher-level tools hide the gruesome details of DDE and let you concentrate on exploiting the data that DDE can make available. *Excel* and *Word for Windows* macros for DDE conversations are easy to write, and Borland's *ObjectVision* lets you declare DDE links to another application in almost exactly the same manner as you would establish links to static data in one of the

ObjectVision-supported databases (*Paradox*, *dBASE*, or *Btrieve*); you don't have to concern yourself with the possibility of the DDE server generating the data values dynamically.

In the next installment of this column, we'll look at using *Word for Windows*' built-in programming language to access almost any type of application and data with DDE. In the meantime, if you've got any DDE-capable application at all, you can use it to play some interesting games with the *Windows* desktop. *Windows* 3.0's Program Manager supports a command-string interface that's mainly intended for use by *Windows* installation programs, but the interface can also be manipulated by any *Windows* application that can send it command strings via WM_DDE_EXECUTE messages. The application and topic names for such a DDE conversation are PROGMAN. The possible formats for the Program Manager command strings are shown in Figure 2.

For an example, the ToolBook button script shown in Figure 3 will prompt the user for a Program Manager group name, application filename, and application title and then send DDE messages to Program Manager that will create or activate the group and install the application in it.

FURTHER READING

- *Microsoft Windows Guide to Programming*. Microsoft Press, Redmond, Washington, 1990; ISBN 1-55615-308-2. Chapter 22, "Dynamic Data Exchange."
- *Microsoft Windows Programmer's Reference*. Microsoft Press, 1990; ISBN 1-55615-309-0. Chapter 15, "Windows DDE Protocol Definition."
- *Programming Windows*, Second Edition, by Charles Petzold. Microsoft Press, 1990; ISBN 1-55615-264-7. Chapter 17, "Dynamic Data Exchange (DDE)."
- "A Technical Study of Dynamic Data Exchange under Presentation Manager." *Microsoft Systems Journal*, Volume 4, Number 3, May 1989, page 1.
- "Interprogram Communication Using Windows' Dynamic Data Exchange." *Microsoft Systems Journal*, Volume 2, Number 5, November 1987, page 13.

THE IN-BOX

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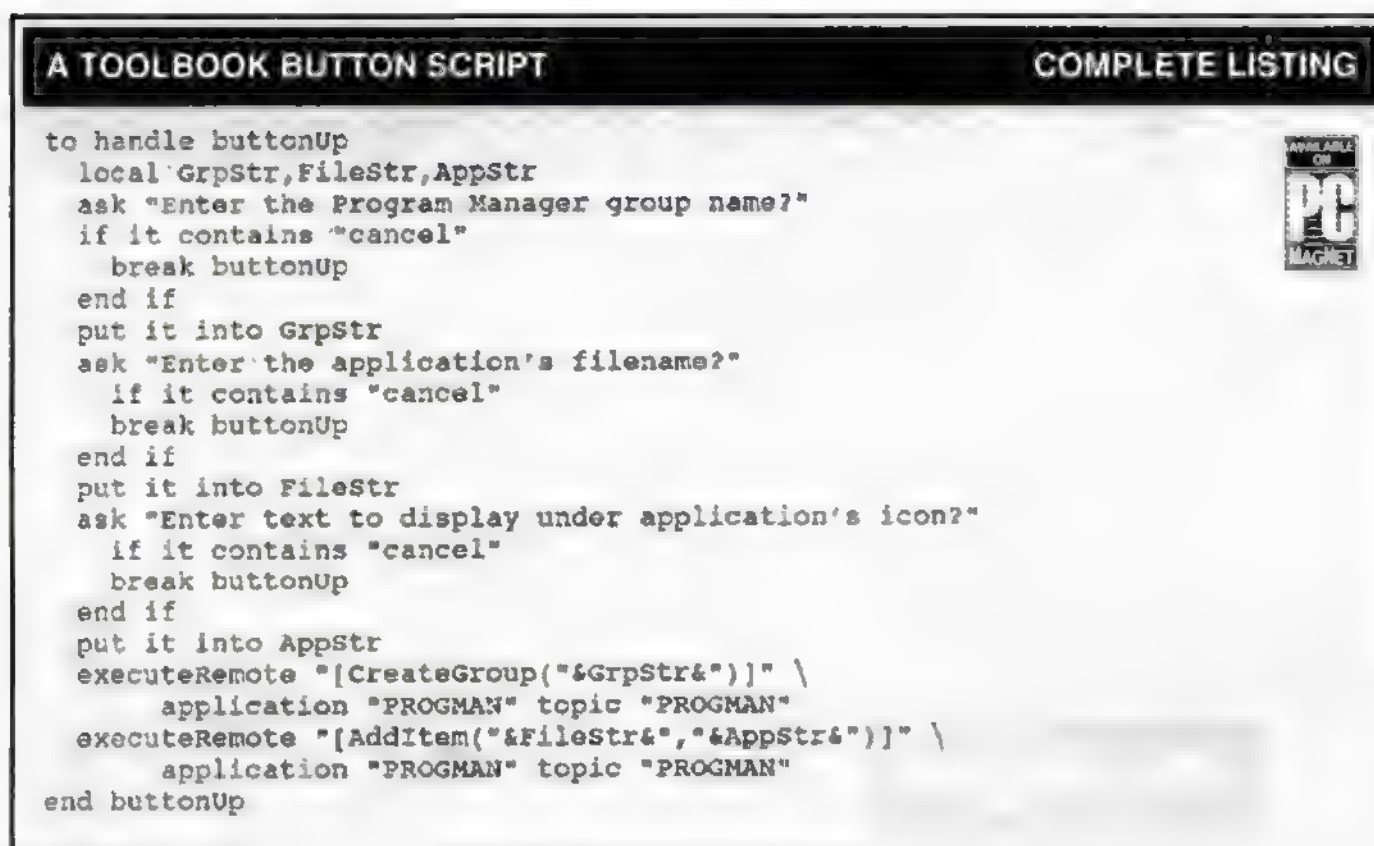
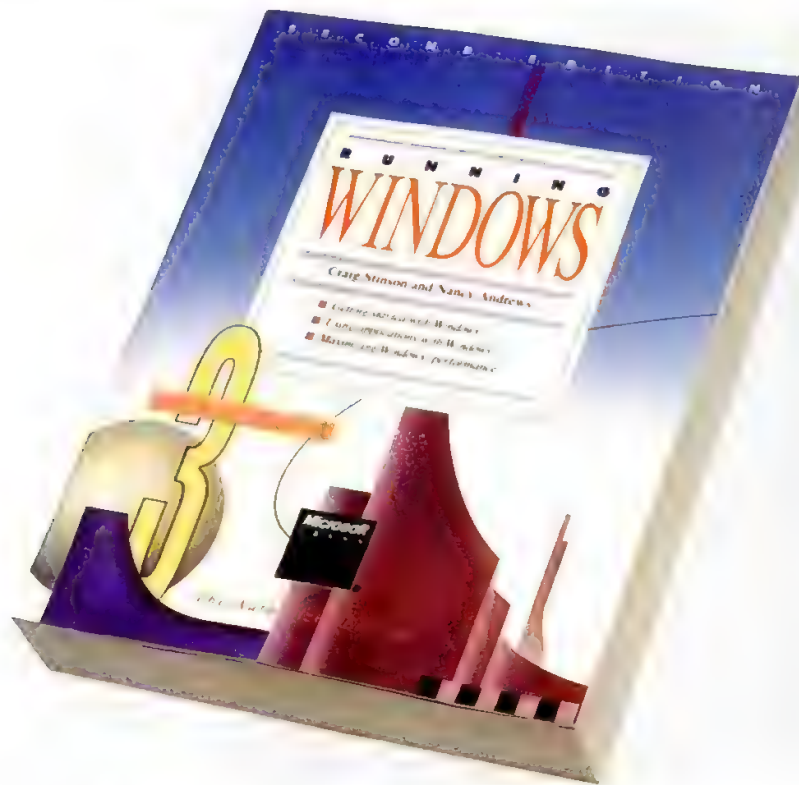


Figure 3: This is a ToolBook button script that prompts the user for the name of a Program Manager group, an application filename, and an application title and then sends DDE messages to the *Windows* 3.0 Program Manager to create or activate the group and install the application in it.

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by
William S. Hall

Windows

STARTING SMALL

I'd like to start *Windows* 3.0 with the digital clock minimized, but can find nothing about it in the documentation. Could you explain how to do this?

Gerard Servito
Teaneck, New Jersey



In WIN.INI, located in your *Windows* directory, you'll find the entry **load=** under the [windows] section header. Using a text editor, such as NOTEPAD or SYSEDIT, change this to

```
load=clock.exe
```

and the clock will appear as an icon when you run *Windows*. In fact you can do the same for multiple *Windows* or non-*Windows* programs, by adding their filenames (with path, if necessary) to the **load=** line. Here's one possibility:

```
load=clock.exe calendar.exe
```

Naturally, you must still observe whatever restrictions *Windows* imposes on how these applications may be loaded.

The **run=** statement provides a related function in WIN.INI. Programs following this statement will execute immediately when you enter *Windows*. Let's say you want *Windows* to start *Winword* and *Cardfile* for you. Just make the entry

```
run=Winword.exe Cardfile.exe
```

You'll find explanations of the **load** and **run** parameters in the file WININI.TXT located in the *Windows* directory. This file can be conveniently read and printed from NOTEPAD.

To help you learn more about *Windows*, Microsoft has released a product called the Productivity Pack. The package contains *Windows* tutorials, a section on troubleshooting and one called Working Smarter. Working Smarter includes the topic Customizing *Windows* Startup, which covers the **load** parameter in

■ **STARTING SMALL:** It's easy to load minimized programs when *Windows* starts.

■ **THE CASE OF THE DISAPPEARING MODE:** What can cause enhanced mode to do a vanishing act.

■ **MACHINE SELECTION:** Changing your machine type in *Windows* if you miss it during installation.

■ **SEARCH-AND-REPLACE MISSION:** Giving Notepad the ability to find and change text.

■ **HIGH MEMORY HURDLES:** If the HMA doesn't unlock more memory, another approach may hold the key.

WIN.INI. The Productivity Pack lists for \$59.95, but that means you can generally find it for around \$45.

By the way, to easily start a program as an icon with *Windows* running, use this nifty trick—double-click on the application while holding down a Shift key.

I should also mention that you can display the clock either digitally or in analog form by making the appropriate choice in its Settings menu. *Windows* actually defaults, strangely enough, to a soothingly low-tech watch with hands.

THE CASE OF THE DISAPPEARING MODE

I'm encountering a puzzling situation using *Windows* 3.0. My Zeos 386SX contains

2MB of extended memory, a 65MB hard disk and runs MS-DOS 4.01. *Windows* starts automatically in enhanced mode, since the computer meets the minimum RAM and processor requirements.

Recently, I installed RAMDRIVE.SYS in extended memory by making the following entry:

```
device=RAMDRIVE.SYS 512 /E
```

in my CONFIG.SYS file. Now, when I look at the About Program Manager dialog box, it shows *Windows* running in standard mode. Why is this?

Regi Soolook
Fairbanks, Alaska



Before addressing your question, I should mention enhanced-mode *Windows* actually demands less than the 2MB you noted. Microsoft's user guide does claim this figure, but you'll notice the actual breakdown—at least 640K conventional and no less than 1MB extended—doesn't add up. You can trust the smaller total.

Your problem may stem from several sources. Many 386 and 486 machines dedicate some RAM for ROM shadowing. If yours does, installing RAMDRIVE may have left you below the 1MB requirement.

I suspect, however, that your Zeos really contains 2MB *total* RAM divided into 640K for DOS and the remainder—only 1,360K—above 1MB. Installing RAMDRIVE reduced the available extended memory to 848K—well below the minimum for enhanced mode, but easily above the 256K required to run *Windows* in standard mode.

If you want to continue using enhanced mode, you can force it using the /3 switch. In addition, you can remove RAMDRIVE or increase your machine's extended memory, but I'd strongly recommend the hardware purchase. 2MB of RAM gives you a pretty marginal enhanced mode, at best.

Windows

MACHINE SELECTION

Be sure to read all the material supplied with *Windows* carefully. My AST 386SX computer has 2MB of RAM, so *Windows* should have run just fine—but it didn't. After considerable frustration, I discovered a separate instruction sheet packaged with the manual. Asterisks marked several systems needing special handling during installation.

Once again I ran SETUP, but instead of zipping past the screen verifying my configuration, I hit Enter. Sure enough, a list of machines including AST 386/486 systems appeared. Once I made the proper selection, *Windows* ran fine and has continued to run without significant problems ever since.

Doug Lindsay
Mukilteo, Washington



Machine selection seems to be one of the most overlooked steps during *Windows* installation. SETUP simply doesn't direct your attention to this important option. I've seen it missed consistently by experienced and inexperienced users alike. Adding to the confusion, SETUP displays a default choice of MS-DOS or PC-DOS System—which applies to every machine capable of running *Windows*!

Fortunately, machine selection is easily corrected, even if you've already installed *Windows*. Change to the *Windows* directory in DOS and run SETUP. Using the Up Arrow key, highlight Computer: just under System Information and press Return to show a list of PCs requiring special attention. Select yours, if it appears. Otherwise, choose the default "MS-DOS or PC-DOS System." (One last option—Other—exists, but if you pick it, you'll need a driver disk from the manufacturer.) Hit the Enter key to return to the main menu. Striking Enter again changes your machine selection.

SETUP looks under the [system] subhead in the file SETUP.INF to find a particular computer's parameters. Figure 1 shows the data for ASTs along with a few comments I added. The only difference between the default and AST machines is the **emmexclude** parameter, which setup reads and then tacks on below the [386Enh] section of SYSTEM.INI. This line tells *Windows* not to build an expanded memory (EMS) page frame in the memory range

THE WINDOWS SETUP.INF FILE

```
"All 80386 and 80486 based AST machines"
system          ; use standard system driver
kbd             ; use standard keyboard driver
t4s8enh        ; keyboard is 101/102 enhanced
nomouse        ; if no mouse selected, use this driver
egahires       ; default video display
sound          ; use standard sound module
comm           ; use standard communications driver
nohimemswitch  ; no switches needed for HIMEM
ebios          ; bios type
"emmexclude=E000-EFFF" ; exclude this area for EMS
```

Figure 1: SETUP.INF functions as a script file for *Windows*' SETUP. Here we show a small piece in the [pif] section. Note the last line, which will cause SETUP to add **emmexclude=E000-EFFF** under the [386Enh] section of SYSTEM.INI.

E000-EFFF. AST, as well as many other manufacturers of 386s, shadows the ROM BIOS in part of this region.

If your computer does demand special treatment, you may want to browse through SETUP.INF to see exactly how *Windows* gets modified. HP machines, for example, use special system, mouse, and keyboard drivers that are supplied by *Windows*. The Toshiba 1600 needs its machine name passed as a switch to HIMEM, and the NEC Powermate SX Plus demands that its ROM BIOS handle the hard disk interrupt **VirtualHDirq=NO** instead of the *Windows* virtual machine.

SEARCH-AND-REPLACE MISSION

Windows Notepad lacks a search-and-replace function, but I've found a simple way to fake it:

- Type your replacement string at the top of the file, highlight it, and use Cut from the Edit menu, which transfers the text to the Clipboard.
- Select Search, then Find, and enter the expression you want changed. Choose the Forward radio button and hit Enter or click on OK.
- Notepad will highlight what it locates. Pressing Del removes the unwanted characters. Shift-Ins will paste the Clipboard's contents into their place.
- Press F3 to look for the next instance, and then repeat the Del/Shift-Ins/F3 sequence until you reach the end.

Kurt Nielsen
Tucson, Arizona



Congratulations to Mr. Nielsen on inventing a search-and-replace technique for Notepad. He has deftly molded standard editing-key functions into a much-needed capability.

Commonly used repetitive processes like this cry out to be automated. *Win-*

dows Recorder—with its ability to memorize and replay keystrokes—is the perfect tool. The simple macro described below makes a valuable Notepad utility that you can use again and again.

Load Recorder as an icon by double-clicking on it in the Program Manager while holding down either Shift key. Follow the search-and-replace procedure above but stop when it finds the first string to delete.

Then restore Recorder. Select File, New and—when the Macro menu appears—Record. Enter a name for the macro, and then choose a hotkey that won't conflict with keys used by Notepad—like Alt-Backspace. Press the Start button to capture the next strokes—Del, Shift-Ins and F3—and Ctrl-Break to stop. Save the macro to a file and then call it with your hotkey to make the remaining substitutions. When the routine can find no more text matching the search specification, a message box will appear to alert you. Simply click on OK.

The next time you're in *Windows*, keep your handiwork ready. Run Recorder, use File Open to load the macro, and then minimize Recorder. To replace text in Notepad now, type the new string right into the file, highlight and cut it, and then execute your macro as many times as needed.

One instruction in this procedure requires a bit of correction—your substitution string should be entered where you want to begin searching, which could be below the top of the file.

Incidentally, if you're ever in doubt about the basic *Windows* editing-key functions, you can always look at the on-line help provided by the Program Manager. Just select Keyboard under the Help menu and choose Editing Keys in the window that appears. You'll find an explanation of how Backspace, Ins, and

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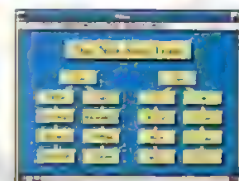
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Windows

Del work in their shifted and unshifted modes.

HIGH MEMORY HURDLES

I have a DOS application that requires about 575K of memory to run. When I was using *Windows/386*, there was just enough memory available to run the program in full-screen mode. Now with *Windows 3.0*, I have only about 530K left—not enough. Microsoft's documentation vaguely mentions a way to access extra memory using the HIMEM area, the real-mode addressable 64K of memory above 1MB. I tried forcing *Windows* to use this extra memory by creating a .PIF file asking for 704K (640 + 64), but the .PIF editor wouldn't allow it. I also tried entering -1 for the KB Required field, but I still got only 640K. How can I make the HIMEM segment available to my program? I'd hate to have to leave *Windows* every time I want to run my application.

Harlan Messinger
Washington, D.C.



The High Memory Area or HMA is the first 64K (minus 16 bytes) beyond 1MB. To use it, a DOS program must be explicitly written to call the services provided by an Extended Memory Specification (XMS) driver, and the XMS driver (such as Microsoft's HIMEM.SYS) must be installed. Very few DOS programs are currently written to take advantage of XMS. Most likely, your application is not XMS-aware and so can't use the HMA to its advantage—whether run from *Windows* or standalone.

In order to run a large DOS program from *Windows*, you'll need to reduce your use of conventional memory. Basically, you have two options to choose from: you can either remove as many device drivers and TSRs as possible or install a product that can squeeze them into unused crevices of memory above 640K while still running *Windows*.

The removal method may work for you, but you'll have a machine with reduced *Windows* performance. Let's say you cut all device drivers except HIMEM.SYS, set buffers to 20 and files to 30 in CONFIG.SYS, and install no TSRs. You'll

get roughly 580K of memory inside a DOS shell executed from enhanced mode *Windows*. What you'll lose are the large performance gains of SMARTDRIVE and RAMDRIVE in *Windows* and DOS, not to mention all the other timesavers you depend on but had to drop.

A far more satisfactory solution is to free some space in DOS's program area by moving those memory-hungry device drivers and TSRs somewhere else. In the March 26, 1991, *Windows* column, we described QEMM-386, a product that can help 386-based machines save precious conventional memory and still allow you to maintain a full configuration.

For an excellent discussion of HIMEM.SYS, see the December 11, 1990, Tutor column.

OPENING WINDOWS

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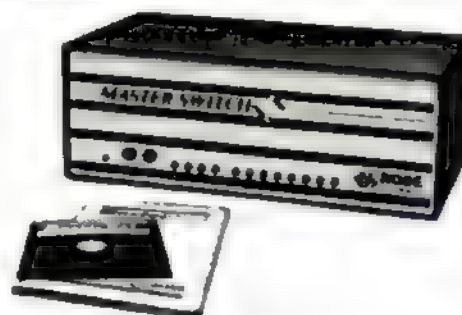
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by
Sal P. Ricciardi

Databases

PRINTSCREEN REVISITED

I recently finished a *dBASE* application that includes the ability to print a copy of the screen when a certain set of conditions is true. I accomplished this by creating *PRTSC.COM*, which simply invokes interrupt 5 (equivalent to hitting Shift-PrtSc) and then returns. I included it in my *dBASE* application as follows:

```
IF <condition>
  RUN PRTSC
ENDIF
```

To create *PRTSC.COM*, first type the following lines into a file called *PRTSC.SCR*. Remember to leave a blank line after the RET and also after the Q.

```
N PRTSC.COM
A 100
INT 05
RET

R CX
3
W
Q
```

Then enter the command

```
DEBUG < PRTSC.SCR
```

which will produce the file *PRTSC.COM*. *PRTSC* can be called by a DOS batch file or from within any application that allows you to execute DOS commands.

Steve Offner
Carlsbad, New Mexico



This falls into the oldie-but-goodie category. It's sometimes nice to be able to provide the equivalent of Shift-PrtSc under program control. Using *PRTSC.COM*, you can do so using the RUN command automatically or by making it a menu selection.

Another alternative is to use a .BIN file instead of the external program *PRTSC.COM*. That way, you don't have

■ **PRINTSCREEN REVISITED:** These two routines let you print a copy of the display screen from within your *dBASE* application.

■ **PADDING WITH ZEROS REVISITED:** Many readers wrote in with alternative methods for left-padding with zeros. Here's one that's short.

■ **CALCULATING AGE:** Compute people's ages using the date of birth and this *dBASE III Plus* routine.

to use the RUN command, which requires more memory and can sometimes affect the display screen.

To create *PRINTSCR.BIN*, type the following lines into a file called *PRINTSCR.SCR*, making sure to leave a blank line after the Q:

```
N PRINTSCR.BIN
E 100 cd 05 cb
R CX
J
W
Q
```

Then enter the command

```
DEBUG < PRINTSCR.SCR
```

This will create the file *PRINTSCR.BIN*.

You can then use LOAD *PRINTSCR* to make the routine available from within your *dBASE* program. Now, whenever you want to print the screen, use CALL *PRINTSCR*. Finally, to remove the routine from memory when you're done with it, use RELEASE MODULE *PRINTSCR*.

PADDING WITH ZEROS REVISITED

In the September 25, 1990, issue, you discussed left-padding with zeros. I employ a much terser algorithm:

```
nums = RIGHT(STR(10^dig+numb),dig)
```

where *numb* is the number to be padded, *dig* is the number of digits to appear, and *nums* is the resulting zero-filled numeric string. For example, let's suppose you want to zero-fill the number 7 to three places. 10^3 is 1,000, so the number inside the STR statement would be 1007. STR converts this to a string and then evaluates RIGHT('1007',3). This yields the right three digits of 1007, or 007 (7 right-padded to three digits), which is the desired result. Note that if *dig* is less than the number of digits in *numb*, the result will be the rightmost *dig* digits of *numb*.

This can be turned into a two-line UDF, which I call ZFILL, as follows:

```
PARAMETERS numb, dig
RETURN RIGHT(STR(10^dig+numb),dig)
```

As an example, ZFILL(1234,6) will return the string "001234", without the overhead of DO loops and IF statements included in yours. This algorithm applies only to positive numbers, but you can modify it to handle negative numbers as follows:

```
nums=IIF(numb<0,'-',')+;
RIGHT(STR(10^dig+abs(numb)),dig)
```

If you want the negative sign to be between the zeros and the first digit, then the methods discussed in the original column are probably necessary.

Stanley MacDonald
Hightstown, New Jersey



We've received a number of responses from readers suggesting alternative ways to left-pad with zeros. This one works quite well. You should note that it works only for values up to nine digits long.

Databases

CALCULATING AGE

If you need to keep track of people's ages, you may be tempted to create a numeric field in a database called AGE. Unfortunately, the problem with this technique is that each age will need to be updated on a yearly basis.

Rather than storing a person's age in the database, you can store his or her date of birth (DOB) and then use the following routine to calculate the age as of today. In addition, you could modify the routine to calculate the age as of some other date by replacing the DATE() function with a date field or variable.

```
*  
* for dBASE III Plus  
*  
*birth_yr = RIGHT(DTOC(dob),2)  
  
birth_md = LEFT(DTOC(dob),2) ;  
+ SUBSTR(DTOC(dob),4,2)  
  
this_yr = RIGHT(DTOC(DATE()),2)
```

```
this_md = LEFT(DTOC(DATE()),2) ;  
+ SUBSTR(DTOC(DATE()),4,2)
```

```
age = INT(VAL(this_yr)-  
VAL(birth_yr) ;  
- IIF(VAL(this_md)  
<VAL(birth_md),1,0))
```

Roger W. Sauer
Fairfield, California



This could be useful for programs where age is important. Mr. Sauer's technique works well when SET CENTURY is OFF and the year is less than 2000. A technique that works independently of SET CENTURY and the year is

```
PROCEDURE AGE  
PARAMETERS d2, d1, age  
d1yr = YEAR(d1)  
d1md = (MONTH(d1)*100) ;  
+ DAY(d1)  
d2yr = YEAR(d2)  
d2md = (MONTH(d2)*100) ;  
+ DAY(d2)  
age = d2yr - d1yr ;  
- IIF(d2md < d1md, 1, 0)  
RETURN
```

You might use it like this:

```
.age = 0  
.set procedure to age  
.do age with ctod("01/01/2000"),;  
ctod("01/01/1900"), age  
.? age  
100
```

This procedure takes advantage of the built-in functions YEAR, MONTH, and DAY. The YEAR function always returns a four-digit year, regardless of the SET CENTURY setting.

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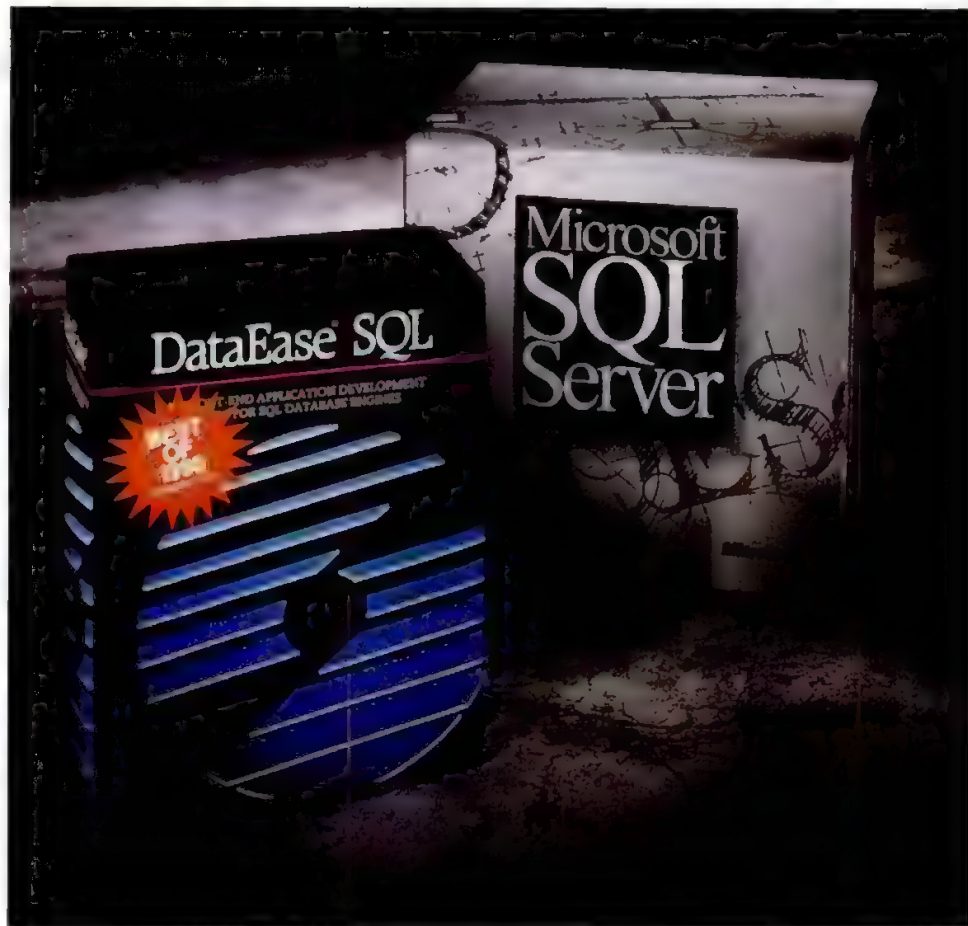
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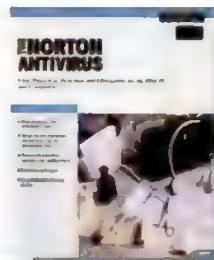
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by
Craig Stinson

Spreadsheets

ARRANGING OPEN WORKSHEETS

I use *Microsoft Excel* worksheets that are fairly wide and that contain the same type of information in the same columns. There are many times when I need to compare the same cell in two or more of these files, so I use the Window Arrange All command to tile all my open worksheets. Unfortunately, this command doesn't divide up the screen space the way I would like. If there are two open windows, for example, the Arrange All command puts the windows side by side; I'd rather have one above the other.

The macro (shown in Figure 1) arranges the screen to suit my particular needs. Each unhidden window gets the full width of the screen, and the vertical space is divided evenly among windows. I assigned the name *Vertical_tile* to the macro and gave it a keyboard shortcut of Ctrl-V. Now, whenever I need to stack my windows vertically, all I do is press Ctrl-V.

William R. Barnard

Durham, North Carolina

■ **ARRANGING OPEN WORKSHEETS:** If you want your *Excel* files tiled, with each spanning the width of the workspace, try this *Vertical_Tile* macro.

■ **AUDITING TOOLS IN EXCEL:** *Microsoft Excel's COMPARE* macro can duplicate the *Lotus 1-2-3 Cell-Formulas* print command, which has no direct equivalent in the *Microsoft spreadsheet*.

through A9 then checks each window to see whether it is hidden. Line A10 assigns the number of unhidden windows to a variable named *Unhidden_windows*. This variable represents the number of

windows that the macro will need to tile.

You should note that the FOR loop uses the function *GET.WINDOW(7)* to determine whether or not a window is hidden. *GET.WINDOW(7)* returns the result TRUE if a window is hidden and FALSE if it is not.

The width of each tiled window will be the width of *Excel's* workspace. That value, in points, is returned by the *GET.WORKSPACE(13)* function in A10. The height of each tiled window will be the height of the workspace divided by the number of tiled windows. The *GET.WORKSPACE(14)* statement in A11 finds the workspace height; the statement in A12 divides the height by the number of windows and assigns the result to a variable named *Ht_per_window*.

The *ARRANGE.ALL()* statement in A13 serves two purposes. First, it ensures that the windows to be tiled are not maximized. This is important because the macro will use the *SIZE* function to adjust each window's size and because this function cannot be applied to maxi-



Mr. Barnard's macro fills a common need. It's too bad *Excel* itself doesn't give you some choice about how its Arrange All command arranges all.

Before it can do its work, this macro needs to know the following information: how many windows are to be tiled, the dimensions of *Excel's* workspace, the dimensions of each tiled window, and the coordinates of the upper-left corner of the workspace.

The statements in lines A3 through A9 determine the number of windows to be tiled. The function *WINDOWS()* returns, in the form of a horizontal array, the names of each window in the workspace, whether they are hidden or unhidden. In line A3 the formula *COLUMNS(WINDOWS())* gets the width of this array (and hence the number of windows) and assigns that value to a variable named *All_windows*. The FOR loop in A5

VERTICAL_TILE

COMPLETE LISTING

```
A
1 Vertical_tile
2 =ECHO(FALSE)
3 All_windows=COLUMNS(WINDOWS())
4 Unhidden_windows=0
5 =FOR("counter",1,All_windows)
6 =GET.WINDOW(7,INDEX(WINDOWS(),1,counter))
7 =IF(A6=TRUE,GOTO(A9))
8 Unhidden_windows=Unhidden_windows+1
9 =NEXT()
10 Wkspce_width=GET.WORKSPACE(13)
11 Wkspce_ht=GET.WORKSPACE(14)
12 Ht_per_window=Wkspce_ht/Unhidden_windows
13 =ARRANGE.ALL()
14 =FOR("counter",1,All_windows)
15 =SIZE(Wkspce_width,Ht_per_window,INDEX(WINDOWS(),1,counter))
16 =NEXT()
17 Window_left=GET.WINDOW(3)
18 Window_top=GET.WINDOW(4)
19 =FOR("counter",2,All_windows)
20 =IF(GET.WINDOW(7,INDEX(WINDOWS(),1,counter))=TRUE,GOTO(A23))
21 Window_top=Window_top+Ht_per_window
22 =MOVE(Window_left,Window_top,INDEX(WINDOWS(),1,counter))
23 =NEXT()
24 =RETURN()
```



Figure 1: This *Microsoft Excel* macro arranges all open files in a vertical stack. The width of each worksheet will be the width of the workspace; the height of each will be the height of the workspace divided by the number of open files.

Spreadsheets

mized windows. Second, it places the first window in the upper-left corner of the workspace—right where we want it to be.

Now that the macro has determined the dimensions of each tiled window, it can go ahead and make the size adjustments. It does this with the FOR loop in A14:A16.

The last detail to take care of is to move the windows. To move a window, you have to specify the *x*- and *y*-coordinates of the upper-left corner of the window's destination. In A17 and A18, Mr. Barnard's macro gets the *x*- and *y*-coordinates of the current window. Since we've just issued an **ARRANGE.ALL** command, the current window is positioned snugly in the upper-left corner of the workspace; hence, the coordinates of this window's upper-left corner are also those of the workspace's upper-left corner. The *x*- and *y*-coordinates are assigned to variables which are named **Window_left** and **Window_top**, respectively.

Now the FOR loop in A19 through A23 can take care of the moving details. Note that the counter variable in this loop starts at 2; that's because the first window is already correctly positioned.

The loop begins by checking to see whether a window is hidden. If it is, the loop skips to the next window. Next, **Window_top** is incremented by the value of **Ht_per_window**, and a **MOVE** function is applied to the next window in line. This process is repeated until all windows have come to a complete stop at the gate, whereupon the macro terminates.

Before tiling, you will probably want to hide the macro sheet containing **Vertical_tile**.

AUDITING TOOLS IN EXCEL

A client who has recently moved from *Lotus 1-2-3* to *Microsoft Excel* has a complaint about *Excel*. The *Microsoft* spreadsheet has no equivalent for *1-2-3*'s **/Print Printer Options Other Cell-Formulas** command—the command that prints the contents of each worksheet cell on a separate line. I thought awhile about how to create an *Excel* macro that will replace the missing *1-2-3* command. Then it finally dawned on me that the *Excel* package already includes a macro that will do the job.

The macro **COMPARE.XLM**, which the Setup program copies to *Excel*'s **LIBRARY** subdirectory, was designed to compare two similar worksheets and list any differences between them. But if one of the two worksheets is blank, **COMPARE** simply gives you a list of the contents of each cell in the other worksheet. Each cell's text, value, or formula appears on a separate line exactly as it would if you used the **/Print Printer Options Other Cell-Formulas** command in *1-2-3*.

Don Baarns
Sylmar, California



Excel offers a number of built-in features for documenting and auditing worksheets. You can attach notes to cells with the **Formula Note** command (or by pressing **Shift-F2**). You can use the **Formula Select Special** command to find all cells whose values depend on a specified cell. Or you can use it to find all cells that affect the value of a specified cell. Other options in the **Select Special** dialog box let you ferret out cells in a particular block that have anomalous contents.

In *Excel 3*, you can trace through a series of dependent formulas by double-clicking. For example, if cell A1 contains the formula

=2*K100

double-clicking A1 takes you straight to K100. If K100 contains a formula referencing J10, you can hop straight to J10 by double-clicking K100, and so on. This method of tracing formula dependencies

works even with formulas that reference external worksheets.

But this is all beside the point, if what you really want is a printout listing the contents of each worksheet cell on a line by itself. The first spreadsheet program, *VisiCalc*, provided this printing option, and all versions of *1-2-3* have followed suit. A printout of this sort may indeed be the form of documentation you favor. This might be particularly true if your experience with spreadsheet programs predates the arrival of more-sophisticated auditing features.

If that's the case, welcome to the **COMPARE** macro. It's available in both *Excel 2.1* and *Excel 3.0*. In the former version, its name is **COMPARE.XLM**; in the latter, it's **COMPARE.XLA**. The procedure for invoking this macro is slightly different in the two versions, but the results are the same.

The first step is the same in either version of *Excel*. Open the worksheet you want to document. Then, if you don't have a blank worksheet on your desktop, use the **File New** command to create one. Next, use the **File Open** command to open the **COMPARE** macro file. (If you're working in Version 3.0 and you want to examine the macro code, simply hold down the **Shift** key while you open **COMPARE.XLA**.)

At this point, the procedure differs for the two *Excel* versions. In Version 2.1, activate the worksheet you want to document, pull down the **Macro** menu, and choose **Run**. In the dialog box, select **COMPARE.XLM!Compare** and click **OK**. *Excel* will then ask you to indicate

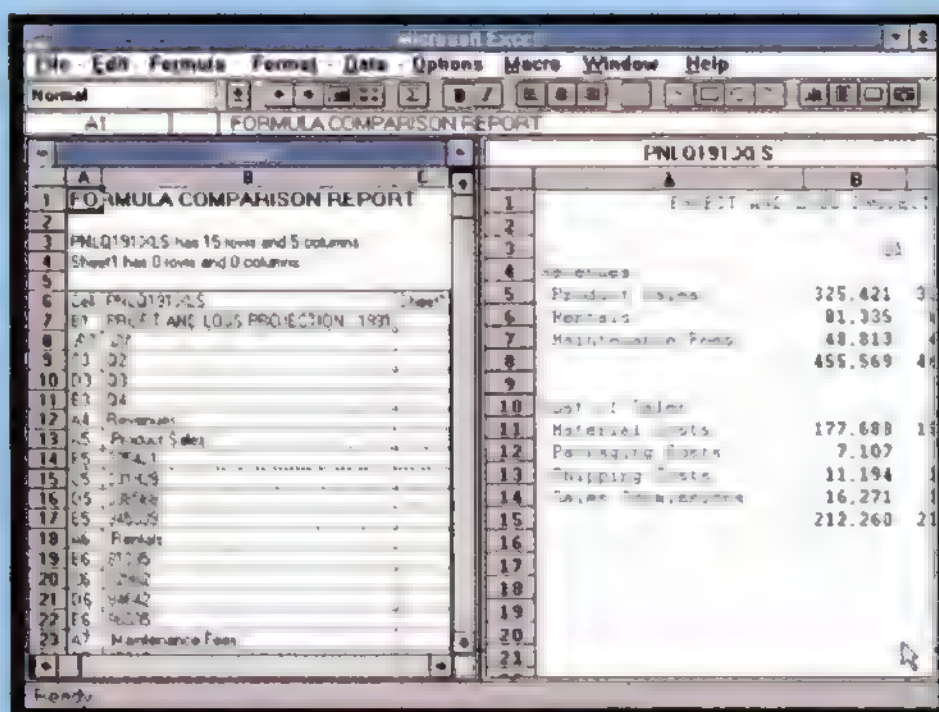


Figure 2: The **COMPARE** macro, which comes with *Microsoft Excel*, is designed to compare two worksheets, cell by cell. But when you execute the macro using a worksheet and a blank file, the macro generates a single-column list (shown here) of the worksheet's cells.

Spreadsheets

which worksheet you want to compare the current worksheet with. Point with the mouse to your blank worksheet or type its name (Sheet1, for example). Click OK or press Enter. In Version 3.0, pull down the Formula menu. Near the bottom, you'll find a new command called Compare. (An Auto_open routine in the COMPARE.XLA file installs this command on the menu.) Next, activate the worksheet you want to document, choose Compare, fill out the dialog box, and then click OK.

While the macro is working, the status line at the bottom of your screen will tell you how much of the comparison has been completed and how many differ-

If all you want to do is print the contents of each worksheet cell on a line by itself, then Excel's COMPARE macro will do the job.

ences have been found. If you're comparing a "live" worksheet to a blank one, you won't care about the number of differences. But if you're using the macro to compare two similar files, this information is likely to be of interest. (If you expect the files to be nearly identical and COMPARE reports hundreds of differences, you may want to abort the macro. You can do that by pressing Esc, and then Enter.)

When COMPARE has finished, you'll have a new worksheet consisting of three columns. Column A will list the address of each cell where COMPARE found differences between the two files. For each of those addresses, column B will list the contents of your first worksheet (the one that was active when you ran the macro) and column C will list the contents of the second. If you're using COMPARE to generate a "Cell-Formulas" printout, column C will be blank.

Figure 2 shows a sample of COMPARE's output.

Note that all labels, values, and formulas in the comparison worksheet are presented in the form of text formulas. The following label

Revenues

for example, appears as

= 'Revenues' '

The numeric formula

=2+2

shows up as the text formula

= ' '=2+2' "

While this representation may look a little odd in the formula bar, it looks perfectly normal on the printout. The good thing about having your formulas stored as text is that you can copy them anywhere within the comparison worksheet—or onto another worksheet—and Excel won't adjust any cell references.

Cell references, incidentally, are listed in Excel's R1C1 notation. For example, if cell B8 of the worksheet you're documenting contains the formula

=SUM(B5:B7)

COMPARE's comparison worksheet will display that formula as

=SUM(R[-3]C:R[-1]C)

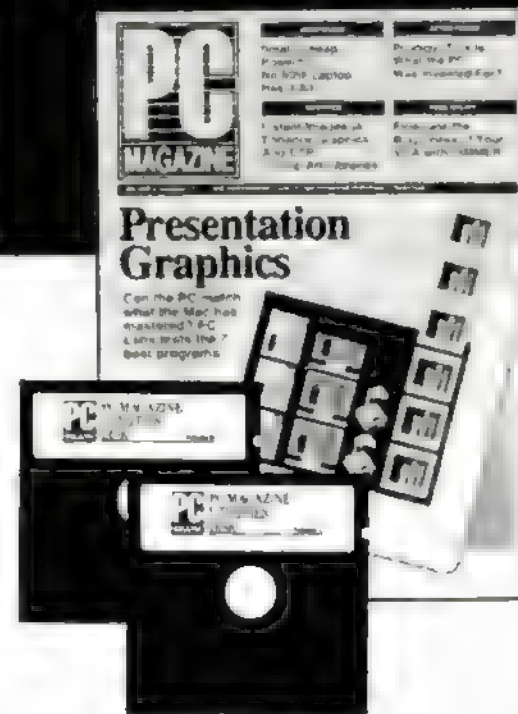
Translated into English, this formula reads, "Sum of the cells three rows above the current cell in the current column through 1 row above the current cell in the current column." You'll find a complete description of the R1C1 notation in your Excel reference manual.

HINTS, TIPS, QUESTIONS

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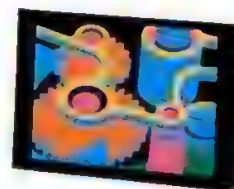


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CIRCLE 732 ON READER SERVICE CARD

by
Costa Rodis

The Working Word

NETWORK ON A SINGLE PC

My family and I share a PC at home. We all use *WordPerfect*, but each of us often has distinct needs, using different sets of edit-screen options, keyboard layouts, and printer fonts. Each also has a separate directory for storing files. Rather than having to change the settings before each use, I take advantage of *WordPerfect* 5.1's built-in solution.

WordPerfect works on both single PCs and network environments. But the network environment has a practical use for the single PC. If you run *INSTALL.EXE* and select O (Other) for the Network option, *WordPerfect* assumes it is running on a network and allows each user to be identified by a three-character code. The program stores that code in the *WP{WP}.ENV* file. Now each user has an individual setup separate from anyone else's.

An additional bonus is that since *WordPerfect* makes an individual environment for each user, a log of computer use is created. Now I can tell who has used the computer and when. Please note that this configuration works only if the network selection is O (Other). If you choose * (Single user, no network), the network installation is canceled. If you choose a network option (such as Novell) other than Other, the *ENV* file is created, but the error message "The network is not loaded!" appears each time *WordPerfect* is run.

Eliot B. Feldman
Willowdale, Ontario, Canada



This is a good idea for people with different needs who must share a computer. Not just families, but small businesses, law offices, and schools can effectively use this straightforward solution to lessen confusion. To get into *INSTALL.EXE*, go to DOS and change the directory to the location of *WordPerfect*, usually *C:\WP51*. Type *INSTALL* and hit Enter. Then hit Enter two more times inside the program.

Choose Network (3), then select Check

■ **NETWORK ON A SINGLE PC:** The Network environment option lets you install your *WordPerfect* program with multiple setup configurations.

■ **FASTER THAN A SPEEDING MOUSE:** A small, customized *Word for Windows* dialog box puts nine of the most common attributes within easy reach.

WP{WP}.ENV. If the file doesn't exist, *WordPerfect* will ask you if you want to create it. Type Y for yes.

You'll then see a list of networks. Type O for Other and type the full path of the directory where you want the Setup files to reside. Exit back to DOS.

The first time you load *WordPerfect* after installing the network environment, the program will prompt you for a code up to three characters long. Type in the characters (such as your initials) and hit Enter. If the program defaults are not to your liking, use Setup (Shift-F1) to change them. From now on, *WordPerfect* will prompt you for the code each time you start the program. Use the code you first entered and your own Setup defaults will be loaded every time.

One last thing: Be aware that if you set up *WordPerfect* to run as if on a network, you cannot access Help (F3) since the program now looks for a network version of the help text.

FASTER THAN A SPEEDING MOUSE

A mouse is a great device for editing text, but I find that it gets in the way during the actual process of writing. As a touch-

typist, it's irritating to have to move my hands from the keyboard to the mouse every time I need to superscript or subscript or use Greek characters. The built-in methods of *Word for Windows* are too awkward, so I wrote the *ATTRIB* macro, shown in Figure 1.

When you run *ATTRIB*, *Word for Windows* pops up a compact dialog box that lists check boxes for any combination of bold, italics, and underline text attributes. In addition, there are option buttons for normal, superscript, and subscript text. More option buttons let you change the current font to Times Roman or Symbol. Not only can the dialog box be used as new text is written, it can also be used to format a block of selected text.

This macro only hints at the power of *WordBASIC*, the *Word for Windows* macro language. Since most *Word for Windows* functions are written in *WordBASIC*, the possibilities of customizing the macro are endless.

Richard F. Daley
College Place, Washington



There is no doubt that the mouse is anathema to the touch typist—until the typing is done and editing must begin.

If you download the macro from PC MagNet, you can easily import it into a *Word for Windows* macro. Using the File Open command, select the file *ATTRIB.TXT*. *Word for Windows* will offer you several file formats; you should choose Text. The program will then bring up the document.

Next, select the macro, choose Cut from the Edit menu, and then Edit from the Macro menu. The program will display a dialog box. Under Edit Macro Name, type in *ATTRIB* (or any other one you want) and click OK. The program will display the Sub MAIN and End Sub commands that mark the beginning and end of a macro. Pull down the Edit menu and select Paste. Voilà: instant macro! *Word for Windows* will insert the macro

ATTRIB.TXT	COMPLETE LISTING
<pre> Sub MAIN REM Check for attributes on. If on then turn them off. If none are REM enabled, then enter a user dialog to enable desired attributes. REM Set Flags. TRUE = 1 OFF = 0 Attribute = OFF REM Check for Bold, Italic and Underline, then Superscript or Subscript. If Bold() = TRUE Then Attribute = TRUE Bold OFF End If If Italic() = TRUE Then Attribute = TRUE Italic OFF End If If Underline() = TRUE Then Attribute = TRUE Underline OFF End If If Superscript() = TRUE Then Attribute = TRUE Size = FontSize() FontSize(Size + 2) Superscript OFF End If If Subscript() = TRUE Then Attribute = TRUE Size = FontSize() FontSize(Size + 2) Subscript OFF End If REM If symbol font is active, return to Tms Rmn. If Font\$() = "symbol" Then Attribute = TRUE Font "Tms Rmn" End If REM If any attributes on, then exit without any user interaction. Otherwise REM open a dialog box to permit the user to select the appropriate attributes. If Attribute = OFF Then GetUserInput Else Print "Attributes returned to normal." End If End Sub </pre>	<pre> REM Subroutine for user dialog box. Sub GetUserInput TRUE = 1 OFF = 0 REM Setup dialog box Begin Dialog UserDialog 355, 120 Text 79, 2, 198, 12, "Select Text Attributes" Text 15, 17, 98, 12, "Attributes" CheckBox 28, 37, 54, 12, "Bold", .Bld CheckBox 28, 52, 81, 12, "Italic", .Ital CheckBox 28, 67, 99, 12, "Underline", .Under Text 117, 17, 54, 12, "Style" OptionGroup .styl OptionButton 122, 37, 72, 12, "Normal" OptionButton 122, 52, 117, 12, "Superscript" OptionButton 122, 67, 99, 12, "Subscript" Text 242, 17, 45, 12, "Font" OptionGroup .fnt OptionButton 247, 37, 99, 12, "Unchanged" OptionButton 247, 52, 81, 12, "Tms Rmn" OptionButton 247, 67, 72, 12, "Symbol" OKButton 86, 98, 64, 18 CancelButton 186, 98, 64, 18 End Dialog REM Do the interactions Dim dlg As Dialog UserDialog Dialog dlg REM Process the results If dlg.Bld = 1 Then Bold TRUE If dlg.Ital = 1 Then Italic TRUE If dlg.Under = 1 Then Underline TRUE Superscript OFF Subscript OFF If dlg.styl > 0 Then If dlg.styl = 1 Then Size = FontSize() FontSize(Size - 2) Superscript TRUE Else Size = FontSize() FontSize(Size - 2) Subscript TRUE End If End If If dlg.fnt > 0 Then If dlg.fnt = 1 Then Font "Tms Rmn" Else Font "symbol" End If End If End Sub </pre>

Figure 1: The *Word for Windows* macro displays a dialog box that lets you quickly format text with often-used attributes. The ones listed can be easily modified in WordBASIC, the program's macro programming language.

between the two commands. Note that since the Sub MAIN and End Sub commands are included in the imported text, you can delete one set. Then simply close the file.

At this point, Mr. Daley's ATTRIB macro need only be assigned to a key combination or added to the menu bar for the dialog box to be quickly popped up on the screen. To do so, just follow these steps:

- Check the menu bar at the top of the screen. If Macro does not appear, click on View and select Full Menus. Macro will then show up to the immediate left of Window.
- To assign a macro to a key combination (such as Ctrl-A), choose Macro, As-

sign to Key. Select ATTRIB from the macro name list and then type the key

With WordBASIC, the possibilities of tailoring the ATTRIB macro are endless.

combination. Hit Enter twice or click on OK. Hold down Ctrl, tap A, and the macro immediately runs.

- To assign the macro to a menu, choose Macro, Assign to Menu. Select the macro name and then the menu name to which you want it attached. Alter the menu text (that is, type out the macro name as you would like it to appear on the menu) and then choose OK.

TIPS FROM WORKING WORDSMITHS

Tell fellow users about your latest word processing discovery; we'll pay you \$50 for any tip we print. Please send your letter on a disk along with a printout to *The Working Word*, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for access instructions).

by
Neil J. Rubenking

User-to-User

CHECKING THE ENVIRONMENT

Over the years, DOS users have become more sophisticated in their use of environment variables, but there's always the question of whether you'll have enough room in the environment to store the variables. Most users know how to enlarge the environment, but a batch program may still try to set up more variables than will fit. You receive an "Out of environment space" error and have to edit the CONFIG.SYS and start over. If you create a batch file that relies on some environment variables to perform its function, and you don't have enough room in the environment, the batch file fails. Often a batch file is written for an end user to execute, and the user may not know what that error message means or how to deal with it.

The method shown in Figure 1 solves the problem. Let's say you wanted to include the following four lines of code in a batch file:

```
SET DOS=IBM_PC_33
SET MON=VGA
SET ADRV=1200
SET BDRV=1440
```

These commands require 38 bytes of the DOS environment. If you've already used some of your environment space, they may not fit.

The easiest way to find out whether the variables will fit is to create a 38-byte variable and let your batch file check to see whether it receives the correct value before proceeding. This prevents a batch program from executing unless there's enough space in the environment, and that's a lot better than seeing a bunch of "Out of environment space" errors.

Robert Laird
Houston, Texas

PC MAGAZINE The environment is simply an area of RAM that contains a series of character strings. Each string consists of a variable name, an equal sign, and the variable's value. An ASCII 0 character

■ **CHECKING THE ENVIRONMENT:** Now your batch files can protect themselves against "Out of environment space" errors.

■ **CREATING A UNIQUE FILENAME:** Here's an amazing utility that transforms a batch file parameter into a unique filename.

terminates each string, and two ASCII 0s in a row end the series of strings. So to calculate the number of bytes a given environ-

ment variable will require, add the number of characters in the name to the number of characters in the value, and add 2 to the result, for the equal sign and ASCII 0.

If you count up the bytes in the four variables above, you'll see that there's a minor error. The author didn't allow for the 0 byte that terminates each variable. In fact, the four variables require 42 bytes of the DOS environment, not 38.

It's not necessary to create a fancy variable like the one in the example—in fact you'll do better to use numbers instead. For example, you can get a 16-byte variable as follows:

```
SET X=4567890123456
```

The number starts with 4 because 3 bytes are already accounted for—one for the name X, one for the equal sign, and one for

ENVCHECK.BAT

COMPLETE LISTING

```
ECHO OFF
SET THIS_VARIABLE_IS=EXACTLY_38_BYTES_LONG
IF NOT 'THIS_VARIABLE_IS'=='EXACTLY_38_BYTES_LONG' GOTO ERROR
SET THIS_VARIABLE_IS=
SET DOS=IBM_PC_33
SET MON=VGA
SET ADRV=1200
SET BDRV=1440
GOTO NEXT
:ERROR
ECHO * ERROR * * * ERROR * * * ERROR * * * ERROR *
ECHO -----
ECHO Your system does not have enough environment space available
ECHO to execute this batch program.
ECHO -----
ECHO If your DOS version is 3.0 or less, you will have to patch
ECHO COMMAND.COM to get a larger environment. DOS versions 3.1
ECHO and up can enlarge the environment with a CONFIG.SYS line:
ECHO.
ECHO.      SHELL=C:\COMMAND.COM /P /E:###
ECHO.
ECHO For DOS 3.1, replace ### with the number of 16-byte paragraphs
ECHO you want in the environment. For 3.2 and up, replace ### with
ECHO the actual number of bytes you want. If your COMMAND.COM is
ECHO not in the root directory of C:, replace C:\COMMAND.COM with
ECHO the actual location of COMMAND.COM. The change will take effect
ECHO after you reboot your computer.
ECHO.
GOTO END
:NEXT
SET
ECHO Environment variables OK -- rest of batch program goes here.
:END
```



Figure 1: This batch file checks to see whether there's enough environment space for its variables—if there isn't, it aborts with a warning.

User-to-User

the final ASCII 0. If your variable name has two characters, start the number with 5, and so on.

You can accomplish the same thing without creating a separate "test" variable, if you're willing to add a check after every SET statement. For example, after SET MON=VGA you could add a line like

```
IF NOT 'MON'=='VGA' GOTO error
```

If you only have to set one or two variables, you may find this easier.

CREATING A UNIQUE FILENAME

UNIQUE.M.SCR (Figure 2) is a DEBUG script for a program that replaces a batch file's first parameter with a unique filename. To keep it small, I ended up with the following restrictions:

- It requires DOS 3.x.
- There is no error checking.
- The first parameter of the batch file that

This experimental utility may not work on all systems. The important thing is that it demonstrates you can read and change DOS's batch file processor.

uses it must be a dummy that is exactly eight characters long.

I also wrote a larger program, UNIQUE.COM. It does error checking; it works with DOS 2.x and 3.x (it should work with 4.x but I haven't tried it), and it can replace any parameter, not just the first.

It was interesting playing with the two programs and finding out how DOS works with batch files. It keeps a pointer that tells it which line to read next. You could do some interesting things by modifying that pointer,

and it wouldn't be too hard to manipulate and parse the parameters. The only big problem would be if you wanted to extend the length of any of them.

Ken Hipple
Madison, Mississippi

PC Batch programs often require temporary files for data storage. I tend to give these files names like TEMP.BAT or ZZZZZZZZ.ZZZ, then cross my fingers and hope they don't conflict with existing filenames. UNIQUE.M eliminates the element of chance—it creates filenames that are guaranteed not to conflict.

Figure 2 is the script to create UNIQUE.M.COM—the small version. Type it in using an editor that can create plain ASCII text, then give the command DEBUG < UNIQUE.M.SCR. If you download this month's User-to-User code from PC MagNet, you'll get a bonus—UNIQUE.ASM and UNIQUE.COM. Unfortunately, the large version was just *too* large to include in the column.

How does UNIQUE.M.COM work? First, it traces the chain of Memory Control Blocks back until it finds a block that owns itself. COMMAND.COM's block should be the only block whose owner pointer points back to itself. Next it locates COMMAND.COM's environment and gets the address of the first batch parameter. It sets up a pointer to that parameter and then creates the unique filename.

The peculiar instructions following the INT 20 call near the end of the script are actually data, not code. They set up the buffer that DOS uses to store the unique filename. To get a unique name, the program calls on DOS function 5Ah (Create Temporary File), introduced with DOS 3.0. It creates the file, closes it, and deletes it, retaining the name. Finally, it replaces the batch parameter %1 with the unique name. Use this tiny batch file to test UNIQUE.M:

```
ECHO OFF
UNIQUE.M
ECHO The unique filename is "%1"
```

Don't forget to call any batch file that uses UNIQUE.M with a dummy first parameter that is exactly eight characters long. If you use a shorter one, the second parameter will get garbled. And if you use no parameters at all, UNIQUE.M can actually crash your system. This is an experimental utility that hasn't gone through extensive

UNIQUE.M.SCR COMPLETE LISTING



```
n unique.m.com
r cx
5A
a 100
PUSH DS
MOV BX,AX
MOV AX,[0016]
MOV DS,AX
CMP AX,[0016]
JNZ 0101
MOV DS,BX
MOV DX,AX
MOV AX,[002C]
DEC AX
AOR SI,SI
DEC AX
MOV DS,AX
CMP BYTE PTR [SI],4D
JNZ 0118
CMP [SI+01],DX
JNZ 0118
POP DS
INC AX
MOV ES,AX
ES:
MOV DI,[000D]
MOV AH,5A
XOR CX,CX
MOV DX,014F
INT 21
MOV BX,AX
MOV AH,3E
INT 21
MOV AH,41
INT 21
MOV SI,DX
INC SI
INC SI
MOV CX,0008
REPZ MOVSB
MOV AL,0D
STOSB
INT 20
CS:
POP SP
ADD [BX+SI],AL
ADD [BX+SI],AL
ADD [BX+SI],AL
ADD [BX+SI],AL
ADD [BX+SI],AL
w
q
```

Figure 2: This script produces UNIQUE.M.COM, which "hacks" DOS's batch file processor to replace a batch file's first parameter with a unique filename.

testing. It may not work on all system configurations. The important thing is that it demonstrates you *can* read and change the internals of DOS's batch file processor.

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edited by
Trudy Neuhaus

Languages

DETECTING REDIRECTION

Turbo Pascal programs that do not use the CRT unit support redirection of the standard Input and Output text files via the usual redirection symbols. For example,

```
PROGNAME < SCRIPT.DAT > PRN
```

will cause PROGNAME to take its input from the file SCRIPT.DAT, rather than the keyboard, and direct its output to the printer device rather than to the screen. By design, DOS provides support for redirection "invisibly"—a program is not supposed to concern itself with the presence or absence of redirection.

However, there are certain situations in which a program could behave more intelligently if it were aware that its I/O was redirected. Programs that generate critical error messages or warnings must make sure that the message actually appears on-screen. And time-consuming programs need to provide status information on-screen so that the user will not be tempted to hit Ctrl-Break or reboot.

Of course, you can deal with both of these situations without actually detecting redirection. By opening a separate file for the console device

```
Assign(console, 'CON');  
Rewrite(console);
```

you can write important messages or status information to the console with statements of the form

```
Writeln(console, message_string);
```

But without detecting redirection, you will not have full control of the screen appearance. For example, messages that must appear both on the screen and in the redirected output will appear twice when output is not redirected.

So the problem is how to detect redirection. Inspecting the command tail in the PrefixSeg won't work, because DOS removes redirection information when it cre-

■ **DETECTING REDIRECTION:** Make your Turbo Pascal programs smarter. Here's how to have them test for I/O redirection.

■ **STORING QUICKBASIC ARRAYS:** Use BLOAD and BSAVE to store arrays on-disk in a flash.

ates the command tail.

If all you want is to detect whether output has been redirected to a *disk file*, the following simple test will do the job. It works because the Turbo runtime library sets the FlushFunc Procedure Pointer to Nil when it opens a file variable as a true file and not as a device:

```
FUNCTION OutputToDisk: Boolean;  
BEGIN  
  IF TextRec(Output).FlushFunc =  
    Nil THEN  
    OutputToDisk := True  
  ELSE OutputToDisk := False;  
END;
```

But this function will not detect when output is redirected to the printer or to the NUL device, and it cannot be adapted to detect input redirection. If you need to detect all forms of redirection, you have to resort to a DOS function call, such as OutputRedirected (shown in Figure 1).

Note that the function tests whether it's the built-in Turbo Pascal file variable Output or DOS Standard Output that is redirected. The result will normally be the same, unless you have specifically assigned the Output file variable to another file or device. If you want to test DOS Standard Output specifically, replace the line `Bx := Handle` with `Bx := 1`.

The listing incorporates these functions into a unit that provides an ECHO function.

In most cases, I don't redirect output to *prevent* its display on the screen. Rather, I redirect in order to *allow* the output to appear somewhere else, such as on the printer or in a file. What I really want is to have the output displayed on the screen *and* somewhere else. If output is redirected, send all data both to the redirected file and to the screen. This capability is implemented by installing a new FlushFunc and InOutFunc for the Output text file device driver (as shown in Figure 1).

If you want to echo all program output, all you need to do is include ECHO in the main program USES clause. Routines are also provided to turn ECHO on and off and to test the current state of echoing. I've also provided a short but useful demonstration (shown in Figure 2) that you can run using various combinations of input and output redirection.

Rick Prescott
Madison, Wisconsin



Do try running ECHODEMO .EXE with input and output redirected. For example

```
ECHODEMO < FILENAME.EXT > NUL
```

OR

```
DIR | ECHODEMO
```

The functions in the ECHO Unit can detect what you've done. It's quite useful to know when your program's output is redirected. For example, you may want it to pause at the end of every screenful of data. If output isn't *going* to the screen, you can skip the pause.

Have you ever had a program fail because the user decided to name the file holding his conference notes CON.NOT? Regardless of the extension used, if you use CON or any other standard device name as a filename, you'll be opening that device, not a file. With a few minor modifications, the OutputToDisk function above can save you from this particular

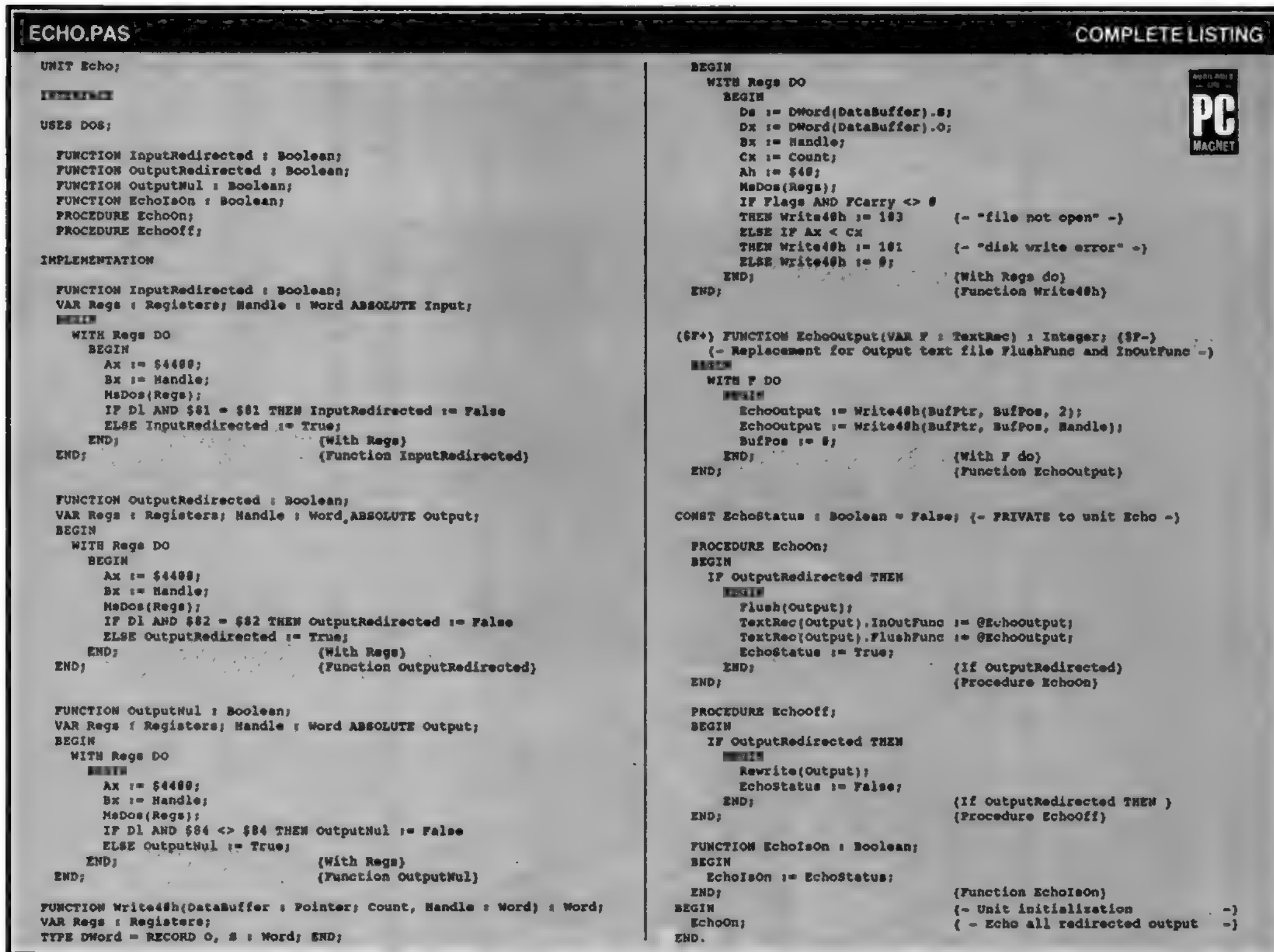


Figure 1: ECHO.PAS detects redirection to let you display messages on-screen even when output is redirected. This works with Turbo Pascal 4.0 or later.

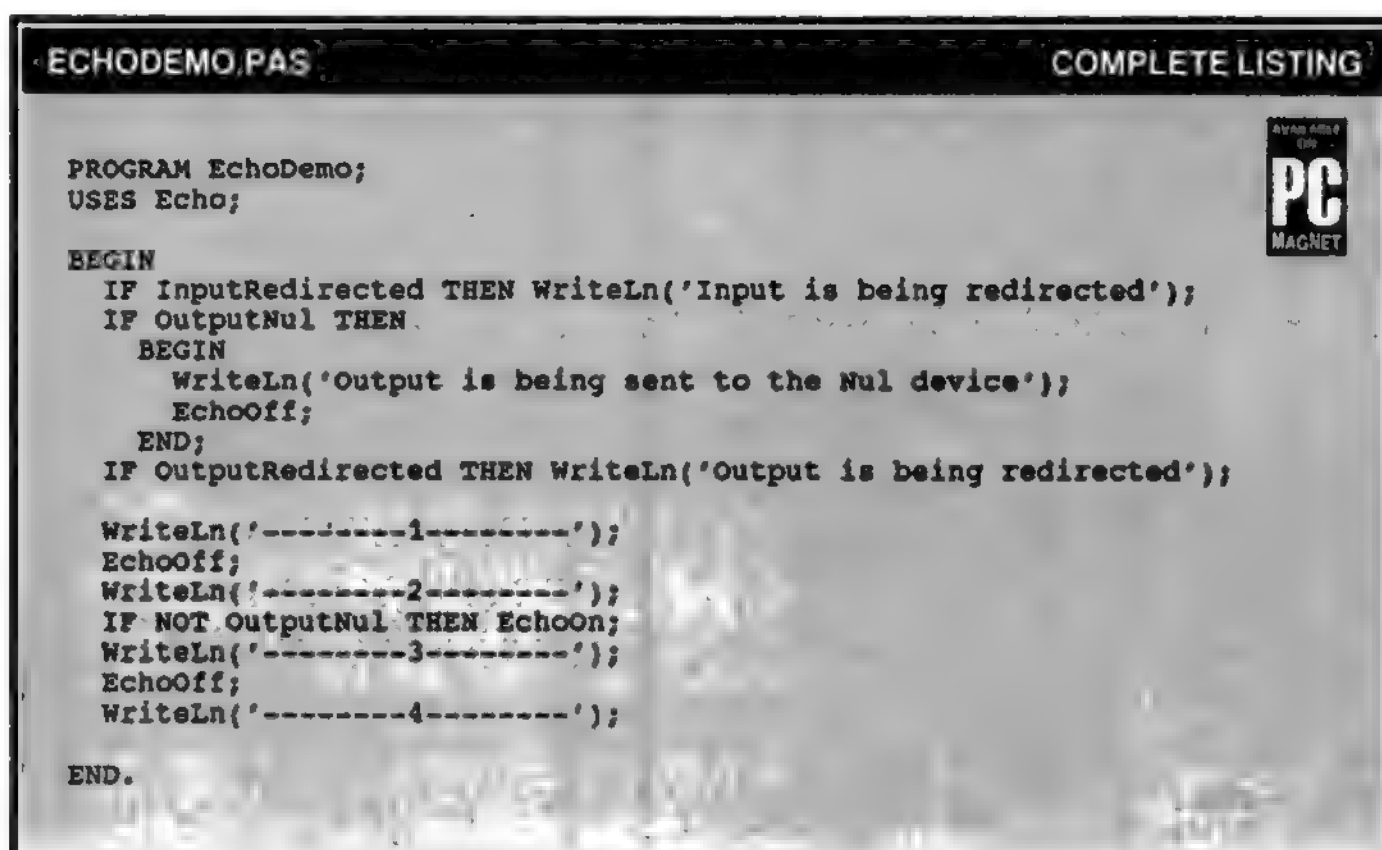


Figure 2: Try running ECHODEMO with input and output redirected—it detects what you've done by using the routines in ECHO.PAS.

problem. Just after you rewrite any text file, call the following function on it:

```
FUNCTION IsD(VAR T:Text):Boolean;
BEGIN
    IsD := TextRec(T).FlushFunc=NIL;
END;
```

If IsD returns FALSE, your program can ask the user to choose another name. That's a lot better than dumping work into the bit bucket by saving it to NUL .OUT!—Neil J. Rubenking

STORING QUICKBASIC ARRAYS

There is a simple QuickBASIC procedure for quickly saving and loading entire arrays to disk using the BLOAD and BSAVE commands. Most programmers would save an array by first opening a file for sequential output and then writing each array element

Languages

to the file with a PRINT # statement. The BLOAD method is many times faster, however, and it also creates a much smaller disk file.

In my own informal testing, I have found a speed improvement of as much as ten times faster. The brief code example shown in Figure 3 shows how BSAVE and BLOAD are used for this. Unfortunately, this technique does not work with conventional string arrays (that is, those that are not fixed-length).

Dale Frakes
Boise, Idaho

 Besides not working with conventional string arrays, BLOAD and BSAVE won't accommodate huge (greater than 64K) arrays. But this method is indeed very valuable within those limitations. It is also very fast. Each time the BASIC PRINT # statement is used, a separate call is made to the DOS Write to a File service. By reading and writing a single large block of memory all at once as

SPEED SAVING AND LOADING ARRAYS

```
DIM Array!(1 TO 10000)      'create a 40000 byte array
DEF SEG = VARSEG(Array!(1)) 'use the segment where the array starts
BSAVE "savetest.dat", 0, 40000 'save 40000 bytes starting at address 0
BLOAD "savetest.dat", 0      'now reload it again at the same address
```

Figure 3: This brief program fragment shows the minimum steps needed to save and then reload an entire array using QuickBASIC's BSAVE and BLOAD.

BLOAD and BSAVE do, the overhead is avoided. But despite this, and despite that DOS is written in assembly language, it still requires a certain amount of time to process each call.

Another important reason that BLOAD and BSAVE are faster is that a snapshot of memory is sent directly to the file, without regard to the meaning of the data. In other words, when a program uses PRINT #1, X%, internally BASIC is calling the STR\$() function to convert the integer X% to an equivalent string. This takes a fair amount of time for integer and long integer data, and even longer for single- and double-precision values. Finally, because each array element is saved in its native format (2 bytes for an integer, 4 bytes for a

long integer or single precision, and 8 bytes for a double), the file will almost always be smaller. That is, an integer stored as ASCII digits could require as many as 8 bytes—a possible minus sign, up to 5 digits, and a trailing carriage return and line-feed.—*Ethan Winer*

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Tutor

MEMORY ALLOCATION FUNCTIONS

Can you explain how the DOS functions that allocate and release blocks of memory work? I'm trying to write a short assembly language program to dynamically allocate (and then deallocate) memory. But when I execute the instructions

```
MOV  AX, 48H
MOV  BX, 0AH
INT  21H
```

to allocate 160 bytes, interrupt 21h returns with the carry flag set, indicating that my request for memory was denied. My system has 640K of RAM. What could be going wrong?

Peter Kirk
Glenfield, Auckland
New Zealand

PC MAGAZINE Function 48h—Allocate Memory—takes as an argument in BX the number of paragraphs of memory requested (a paragraph is 16 bytes). If the function returns with the carry flag clear, then the request was met and the segment address of the allocated block is returned in AX. If the request fails (usually because there was insufficient memory available to satisfy the request), the carry flag is set and BX returns with the size of the largest contiguous block available (in paragraphs). It's this feature that permits programs to determine how much RAM is free in the system. If function 48h is called with BX set to FFFFh (corresponding to 1MB of RAM, more conventional memory than can possibly be available), DOS returns the number of paragraphs free in BX.

Function 49h—Release Memory—reverses the action of function 48h. Once a block is allocated, it can be released—returned to the free memory pool—by calling function 49h with the segment address of the block in register ES. The segment addresses passed in ES must be the ones obtained earlier from function

■ **MEMORY ALLOCATION FUNCTIONS:** A look at the three functions a program can use to allocate, release, or resize a memory block.

■ **COMMAND PERFORMANCE:** How to make sure the transient portion of COMMAND.COM gets reloaded.

48h. Blocks can be deallocated in any order, regardless of the order in which they were allocated.

Closely related to these functions, func-

tion 4Ah modifies the size of a memory block previously allocated with function 48h. You pass this function the segment address of the block to modify in ES and the new size of the block (again, in paragraphs) in BX. If the current structure of memory permits, DOS will shrink or expand the block to conform to the requested size and return with the carry flag clear. If for some reason the request can't be met, function 4Ah returns with carry set. Calls to this function rarely ever fail when a memory block is being reduced in size, but increasing the size of the block won't be possible if there's insufficient memory or if another block above the one being modified prevents it from being expanded to the desired size. Blocks of memory allocated with these functions are always contiguous.

When a program requests a block of memory, DOS begins in low memory

HOW TO SHRINK A .COM FILE'S MEMORY ALLOCATION TO 64K

```
start:  mov  ah, 4Ah      ;Function 4AH
        mov  bx, 1000h   ;Block size = 4096 paragraphs
        int  21h
        jc   error       ;Branch on error
```

Figure 1: This code sequence, if executed by a program with a .COM extension and with ES pointing to the program's PSP segment, will reduce the amount of memory allocated to the program to 64K.



FORMAT OF THE DOS MEMORY CONTROL BLOCK

Offset(s)	Size	Description
00h	Byte	End-of-chain identifier 4Dh = Not the last block 5Ah = Last block in chain
01h	Word	PSP address of the program that owns this block of memory
03h	Word	Length (in paragraphs) of this block of memory
05h-07h	---	Unused
08h-0Fh	---	ASCII name of the program installed in this block of memory if one is installed (DOS 4.x only; unused in earlier versions)

Figure 2: Each block of memory is preceded by a 16-byte memory control block that specifies the size of the block, who owns it, and whether there are other blocks following it.

just above the area where the operating system kernel is loaded and searches upward until it finds an unused region of memory equal to or larger than the size of the requested block. Then it sets aside the amount of memory the program requested. If it reaches the top of memory without finding a suitable region of free memory, DOS returns an error code indicating that there's not enough memory.

You're probably having this problem because .COM files are allocated every byte of conventional memory available in the system when they're loaded. When your program asks for additional RAM (assuming it is a .COM file), DOS denies the request, because there's no memory left to allocate. .COM files, unlike .EXE files, don't have headers that define how much memory they need. To be safe, DOS allocates all remaining memory to a .COM program so that it's assured of having enough.

For good form, .COM programs should shrink the amount of memory they're allocated to just the amount they need when they first start up. Then subsequent requests for memory will be fulfilled, and other programs running in the system—TSRs, for example, which are free to make memory requests of their own—won't be starved for RAM.

It's easy for a .COM file to shrink its initial memory allocation down to 64K. The code in Figure 1 shows how it's done. Function 4Ah is called with the value 1000h in BX (1000h paragraphs is 64K) to shrink the block the program resides in. This routine assumes that the value in the ES register hasn't changed since the program was started. If it has, ES must be reloaded with the address of the segment where the program is loaded before interrupt 21h is called. After this code sequence is executed, your request to allocate an additional 160 bytes of memory should work.

THE STRUCTURE OF MEMORY

To be really efficient with memory, you could shrink the memory block the program is loaded into even further if it doesn't require a full 64K. But remember that the SS register points to the base of the segment and that SP initially points to the top of the 64K segment, causing the stack to grow downward in memory from that

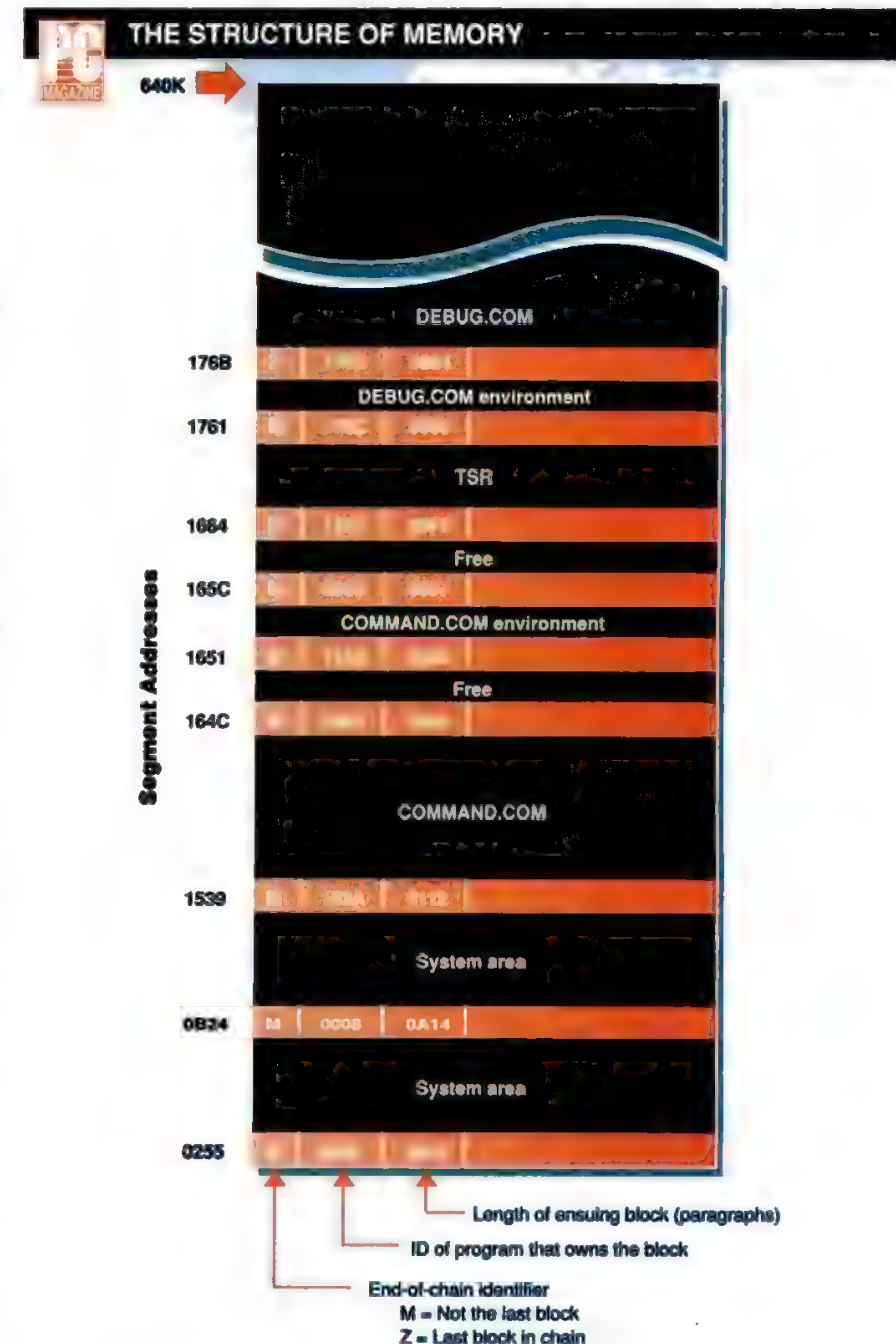


Figure 3: DOS divides memory into a series of blocks. Each block is preceded by a memory control block, or MCB, which specifies the size of the ensuing memory block, what owns it, and whether there are other blocks following this one. This memory map shows a typical layout for memory with one TSR installed and DEBUG.COM loaded and running. MCBs are highlighted in red.

point. If you shrink the memory block to less than 64K, you'll need to reset SP to the top of the resized block. Otherwise, the stack may be overwritten by other programs, resulting in a system crash. This won't happen under normal circumstances, because there's usually only one process running in the system at a time.

But if a TSR grabs control of the CPU and requests more memory from DOS, it could be allocated the memory where the stack is located, if the proper precautions aren't taken. And that's Trouble, with a capital T.

Understanding how DOS structures memory also helps you understand DOS's

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Tutor

memory allocation and deallocation functions. DOS divides all the memory that it makes available to application programs into a series of blocks that can be as little as 1 paragraph in length or as large as 1MB. When a program is loaded, it is allocated two blocks: one to hold a local copy of the environment and one to store the program itself. If the program requests more memory, additional blocks are carved out of the remaining memory and set aside for it.

TSRs typically deallocate their own environment blocks before they terminate and become resident in memory. They don't usually need what's in the environment blocks, and releasing the memory makes more memory available for subsequent programs.

Each block is preceded in memory by a 16-byte *memory control block* (MCB), which specifies the size of the ensuing block, who owns it, and whether there are other blocks following it. The format of an MCB is diagrammed in Figure 2.

The first byte in the MCB indicates whether this is the last block in the chain. A value of 4Dh indicates that it isn't; a value of 5Ah indicates that it is. Not coincidentally, these values are actually the ASCII codes for the letters M and Z, the initials of one of Microsoft's primary DOS architects, Mark Zbikowski. The second and third bytes hold the program segment prefix (PSP) address of the program that owns the block.

A value of 0 indicates that the block is free; a nonzero value specifies that it's owned by somebody. In DOS 4.0, if the subsequent memory block holds a program, the name of the program is copied to the last 8 bytes of the MCB. These bytes were unused in the earlier versions of DOS.

The fourth and fifth bytes hold the length of the memory block (in paragraphs) that begins in the paragraph following the MCB. By adding the block length to the segment address of the current MCB and adding 1, you can derive the segment address of the next MCB in the chain. Together, the MCBs form a linked list that maps out the entire memory allocation chain.

Figure 3 illustrates how memory is structured on a typical PC with one TSR installed and DEBUG.COM loaded and

running. MCBs are highlighted in red.

The first two memory blocks (whose MCBs are located at segments 0255h and 0B24h, respectively) are reserved for system use. The block following the MCB at segment 1539h holds COMMAND.COM. The blocks at segments 164Ch and 165Ch are free, while the block that separates them holds COMMAND.COM's copy of the environment. Note that the owner of the environment block is 153Ah, the segment where COMMAND.COM is loaded. The block at segment 1664h holds a TSR. The final two blocks hold DEBUG.COM (note that all the rest of memory is allocated to it) and its copy of the environment. When DEBUG terminates, all RAM above segment 1761h will be returned to

To conserve memory, COMMAND.COM splits itself into two halves when it's loaded: the resident portion, which sits in low memory; and the transient portion, which is loaded at the top of conventional memory.

the free memory pool to be used by subsequent programs.

COMMAND PERFORMANCE

When I exit certain programs, such as Lotus 1-2-3, my system hangs after displaying the message

```
Invalid COMMAND.COM
Cannot load COMMAND, system halted
```

COMMAND.COM is located in the \DOS directory of my C: drive, and my CONFIG.SYS file contains the statement

```
SHELL=C:\DOS\COMMAND.COM /E:512 /P
```

which clearly spells out the path to the

command processor. What am I doing wrong?

Arthur Morgan
Grahamstown, South Africa



The mistake you're making is a common one: you're telling DOS where to find COMMAND.COM, but you're not telling *COMMAND.COM* where to find COMMAND.COM so that it can reload the transient portion of itself from disk when needed.

It may seem a little strange that COMMAND.COM needs to know what drive and directory it's located in, but there's a good reason. In order to conserve memory, COMMAND.COM splits itself into two halves when it's loaded: the *resident portion*, which sits in low memory; and the *transient portion*, which is loaded at the top of conventional memory. If an application program needs the space occupied by the transient part of COMMAND.COM, DOS lets the application have it. Then, when the program terminates and control goes back to COMMAND.COM, the resident portion of COMMAND.COM checks to see if the transient portion was corrupted and reloads it from disk if it was.

To find out where it's located on-disk, COMMAND.COM looks at the COMSPEC environment string. If COMSPEC is set to C:\DOS\COMMAND.COM, for example, COMMAND.COM looks to the \DOS directory of drive C:. If there's no copy of COMMAND.COM there, the resident COMMAND.COM displays the "Invalid COMMAND.COM" error message you described and promptly halts the system.

There are two ways to correct the problem. One solution is to modify the SHELL statement in CONFIG.SYS to read

```
SHELL=C:\DOS\COMMAND.COM C:\DOS
/E:512 /P
```

The extra string that's found between C:\DOS\COMMAND.COM and /E:512—C:\DOS—sets COMSPEC equal to C:\DOS\COMMAND.COM. In the absence of this parameter, COMSPEC is simply set to C:\COMMAND.COM, despite the fact that the SHELL directive loads COMMAND.COM from C:\DOS. With COMSPEC set this way, the system will lock up the first time COMMAND.COM is reloaded from disk if there isn't a copy stored in the root directory.

A second way to correct the problem

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Tutor

is by adding the statement

```
SET COMSPEC=C:\DOS\COMMAND.COM
```

to your AUTOEXEC.BAT file. This line has the same effect as including C:\DOS as a parameter to COMMAND.COM in CONFIG.SYS: it points DOS to COMMAND.COM by setting the COMSPEC variable properly.

At least that's the theory. Now for the caveats: There are two version-specific quirks in DOS's handling of the COMSPEC variable. First, setting COMSPEC with a SET command in DOS 2.x doesn't have the effect of pointing COMMAND.COM to the drive and directory where it's stored. Rather than referring to COMSPEC, COMMAND.COM looks for it in the location specified in the SHELL statement in CONFIG.SYS. If you're still running Version 2.x, the solution is to add the string "C:\DOS" to your SHELL statement as described above.

The second quirk relates to the FOR-

MAT command. When you format a floppy disk with the /S parameter, FORMAT is supposed to use the COMSPEC variable to find COMMAND.COM so that it can copy it to the floppy disk. And it does—in most versions. In some releases of DOS 3.2 and 3.3, however (MS-DOS 3.20, 3.21,

If COMMAND.COM
isn't in the root
directory, sometimes
FORMAT won't find it.

3.30, and 3.30a are known offenders), COMMAND.COM must be located in the root directory of the boot drive or FORMAT won't find it. If you load COMMAND.COM from somewhere besides the root directory in these versions of DOS and execute a FORMAT /S command, FORMAT will prompt you to insert a DOS floppy.

If you use DOS 3.x or 4.x, you can speed up your system slightly by copying COMMAND.COM to a RAM disk and pointing COMSPEC to the RAM disk rather than drive C:. Then, when the transient portion of COMMAND.COM is reloaded from disk, it will be retrieved from the RAM disk rather than from the hard disk. If the RAM disk is drive F: and COMMAND.COM is located in the root directory of drive C:, you can accomplish this by adding the commands

```
COPY C:\COMMAND.COM F:\
SET COMSPEC=F:\COMMAND.COM
```

to your AUTOEXEC.BAT file.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. To have your question answered, write to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for access instructions). We're unable to answer questions individually. ■

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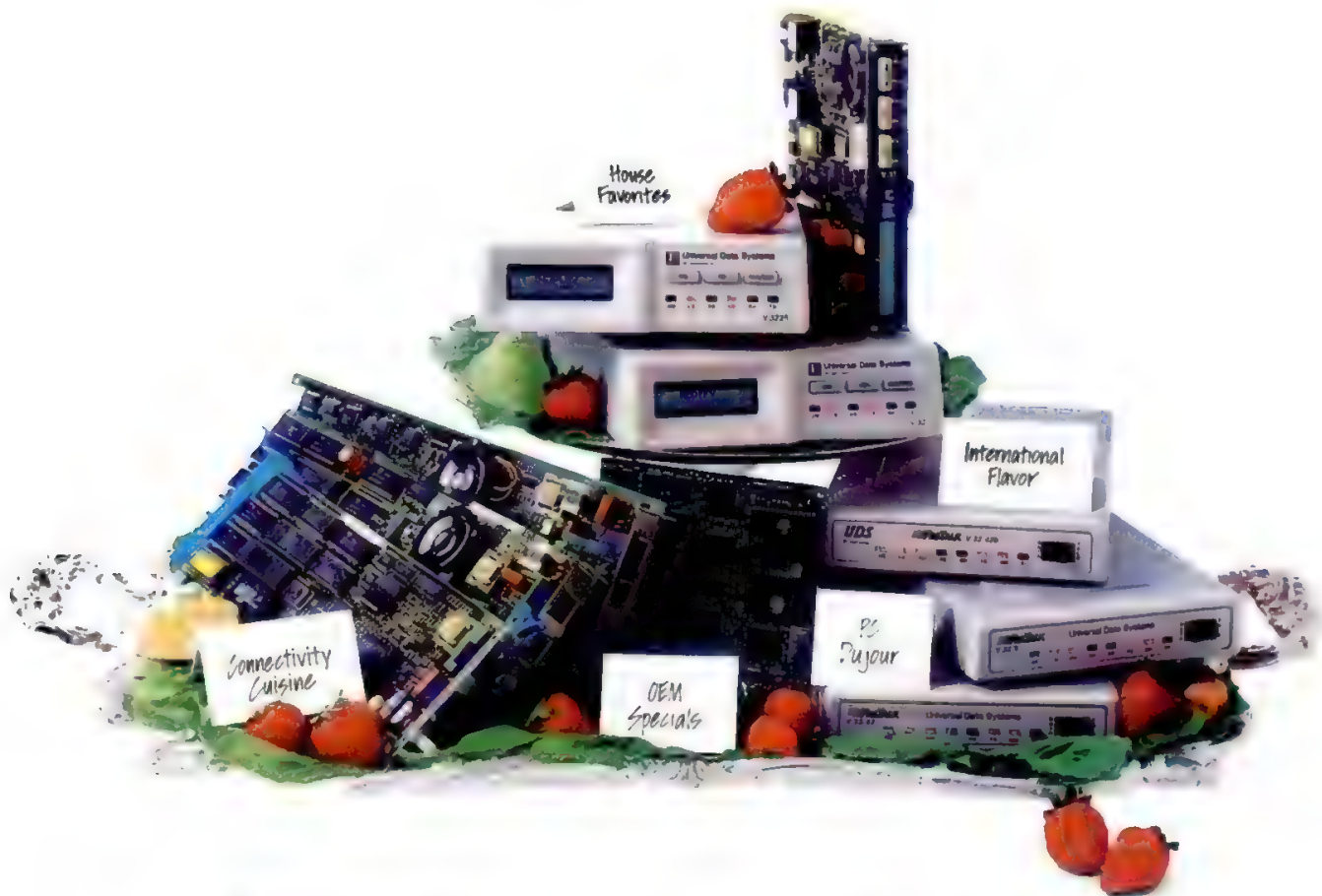
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by
Frank J. Derfler, Jr.

Connectivity

MULTIUSER DOS FEDERATION UPDATE

The December 11, 1990, Connectivity column welcomed the inauguration of the Multiuser DOS Federation. As we noted, this new group will set standards for multiuser systems using DOS applications and will also help users understand the value of these systems as an alternative to more-expensive, media-shared LANs.

Mike Seither of the Federation recently brought us up to date on the activities of the MDOS Standards and Certification Committee. This group expects to issue a technical white paper on multiuser standards early in 1991.

Call the Multiuser DOS Federation at its new phone number, 800-777-MDOS, for information about multiuser DOS standards and products.

SAVING MONEY

Our equipment budget is limited. We've saved money on computers by buying through ads in *PC Magazine*, but haven't found an inexpensive source of IBM 3270 coax adapters. Do you know of a low-cost 3270 coax adapter we can trust?

William MacLean
Washington, D.C.



When the family budget gets tight, we buy generic macaroni. When corporate budgets are limited, buying some generic products, particularly those using tried-and-true technology, also makes sense. Whitebox sells generic connectivity products, including a 3278/79 adapter that emulates either an IBM or a Digital Communications Associates IRMA adapter. We've used these boards in the PC Magazine LAN Labs with 3270 terminal emulation software marketed by DCA, Attachmate, IBM, and Wall Data, and they all work together without a glitch. Whitebox sells the adapter for \$395 and it discounts prices for quantity buys. If you'd like more information on these products, call Whitebox at 404-446-8673.

- **SAVING MONEY:** Sometimes buying generic connectivity products makes sense.
- **MORE ON PRINT-NODE FAILURES:** Another way to keep your print servers working.
- **HELP FOR A BUSY LAN:** Memory managers mean more room for processing on hard-working client PCs.
- **PRINTER PLACEMENT:** Get true parallel printer connections at up to 50 feet.
- **AUTOMATING BATCH FILES:** Use KEY-FAKE.COM to speed network procedures.

MORE ON PRINT-NODE FAILURES

I'd like to add to the information on print-node failures that you discussed in the November 27, 1990, column. We have 14 networks across the state of Texas, all running *Advanced NetWare 286*, Version 2.15c, and *LANSpool 1.57* over ARCnet adapters. We've experienced the same problem that you spoke about—random failure of print nodes.

After extensive phone calls to our *LANSpool* vendor representative, which resulted in many different *SHELL.CFGs* and even more print-node failures, I finally received some help from my Novell user group.

The solution to our problem was twofold, and you described one part in your column when you suggested waiting at

least 45 seconds before loading a *NetWare* value added process (VAP). We added the line `VAP WAIT = 45` to our `CONFIG.UPS` file in the server.

Unfortunately, that long wait still presented a problem when 70 client workstations were trying to access the LAN. The stations that are *LANSpool* print servers would not connect to the VAP if they logged into the LAN before the VAP was loaded.

We discovered that if a LAN has at least one active workstation when *LANSpool* starts, *LANSpool* will allow print servers to attach. In this case it doesn't matter whether or not the active station is a print server.

Thomas H. Embleton
Austin, Texas



LANSystems is well aware of the problem and points out that this happens only with certain ARCnet adapters. I suspect that it's unique to some of the software drivers for ARCnet adapters. When ARCnet comes up, these ARCnet drivers retain all the available routing buffers. Then, when *LANSpool* tries to use an `IPX SEND` command to broadcast its status, it finds no buffers available and fails. Version 2.0 of *LANSpool* checks to see whether the broadcast failed and, if it did, uses a directly addressed message to work around the problem.

As you've discovered, having a PC with an ARCnet adapter powered up (it doesn't even need `NET3` or `IPX` loaded) on each LAN segment somehow causes a reallocation of buffers and avoids the problem. For best results, be sure you have the latest version of *LANSpool* as well as the latest drivers for your ARCnet adapters.

LANSystems (801-373-1590) is anxious to talk to anyone who is experiencing this problem. The company has worked hard to improve its technical support in the last few months, and I think you'll find it responsive.

Connectivity

HELP FOR A BUSY LAN

Several years ago, we downsized our processing from a mainframe to a PC network. We installed a Token-Ring LAN with approximately 120 80386-based client PCs using the Banyan VINES network operating system. We have six database servers running Gupta Technologies' *SQLBase*, Version 4.0.4, (DOS) to support the database-processing load of a major state agency.

With this combination, we really discovered the meaning of DOS RAM cram in the client PCs. But we've had good luck using Qualitas's *386MAX*, Version 5.0, with the Banyan software. We can load all the Banyan workstation drivers into high memory and use the extended memory version of the Gupta workstation database router. This version leaves about 60K of the database router in low memory, so the workstations have about 520K of useful RAM.

Jim Sutton
Richmond, Virginia



It's interesting to hear about your successful use of Gupta *SQLBase* and memory management software with Banyan's *VINES*. We reviewed *386MAX* along with other memory management programs in the January 29, 1991, issue of *PC Magazine*, but we didn't test these programs with *VINES*. Stories like yours clearly point out why organizations should use 386-based computers as terminals on their networks. The multiple software drivers used on modern LANs can consume hundreds of kilobytes of memory, and it's essential to move them into extended memory whenever possible. You just can't get the same effective memory management techniques from PCs with 80286 processors.

PRINTER PLACEMENT

In your discussion on extending parallel printer cables in the December 11, 1990, issue of *PC Magazine*, you might have recommended the SmartPrint automatic print switch sold by Dresselhaus (800-368-7737). This device extends the viable parallel printer distance to 50 feet, using a true parallel cable with 25 wires and a male connector on each end.

If being able to move your printer 25 or so additional feet solves the printer-place-

ment problem, this is a good and inexpensive solution—the four-port version of the switch retails for \$199 and is available for less through mail-order houses. This isn't a high-powered solution, but it works.

Beverley H. Harris
Santa Fe, New Mexico



Even though the price of the 25-wire cable you mention is much more than for the simple twisted-pair wiring used by the products I described in the December column, the total cost of the installation is still less using the product you recommend.

It isn't as easy, though, to drag a 25-wire cable around the office. But if someone has a specific requirement for full parallel port connectivity, your suggestion is worth considering. Note that you might want to invest in shielded parallel-printer cable to reduce the potential for problems caused by interference.

AUTOMATING BATCH FILES

As a computer operations manager, I notice that users get frustrated by the structured menu in the Novell PConsole utility, which they access frequently to check the status of the several output devices connected to our network. As any *NetWare* user knows, this tedious procedure involves several cursor moves and Enter keystrokes. Typing in the first letter of menu options is a little easier, but it's not much help when many of the printers have similar names.

I've discovered a way to speed up the process considerably, with *PC Magazine*'s KEY-FAKE utility. For example, to make it easy for users to check the status of our LaserJet II printer, I created CHKII.BAT, a simple three-line batch file that completes the PConsole keystrokes:

```
ECHO OFF
Key-Fake 13 @80 @80 13 13
Pconsole
```

CHKII.BAT calls KEY-FAKE and loads it with keystrokes. The batch file then runs PConsole and KEY-FAKE feeds it the necessary keystrokes.

The first KEY-FAKE parameter, 13, executes a carriage return, accepting the default for the initial menu selection within PConsole. The @80 parameter is the Down Arrow key, so the cursor moves down one line for each to highlight the correct printer on PConsole's list. The last two 13s finish the job with carriage returns.

This procedure is really fast and efficient. I've written similar batch files for each of our output devices and placed them all, as well as KEY-FAKE.COM, in the PUBLIC directory on the SYS: volume. Users can run these batch files from any directory.

You can speed the process even more by redefining the function keys in the batch files. Many users now access PConsole and get the status of a particular device with a single keystroke.

Elgene C. Wheeler
Winter Park, Florida



KEY-FAKE.COM was first released in late 1985. It's one of our oldest *PC Magazine* utilities, but still one of the best. This little .COM file is only 536 bytes, and as this letter shows, it has endless possibilities. You can use it to make many network resources available to people without training them to work through menus or enter arcane responses.

I'm surprised more of you who are network administrators haven't also caught on to our BATCHMAN utility, which was published in the January 30, 1990, issue of *PC Magazine*. BATCHMAN uses the ERRORLEVEL code (illustrated several times in this column in the past) to help you customize your batch files to play tunes and set colors, as well as to perform more serious chores.

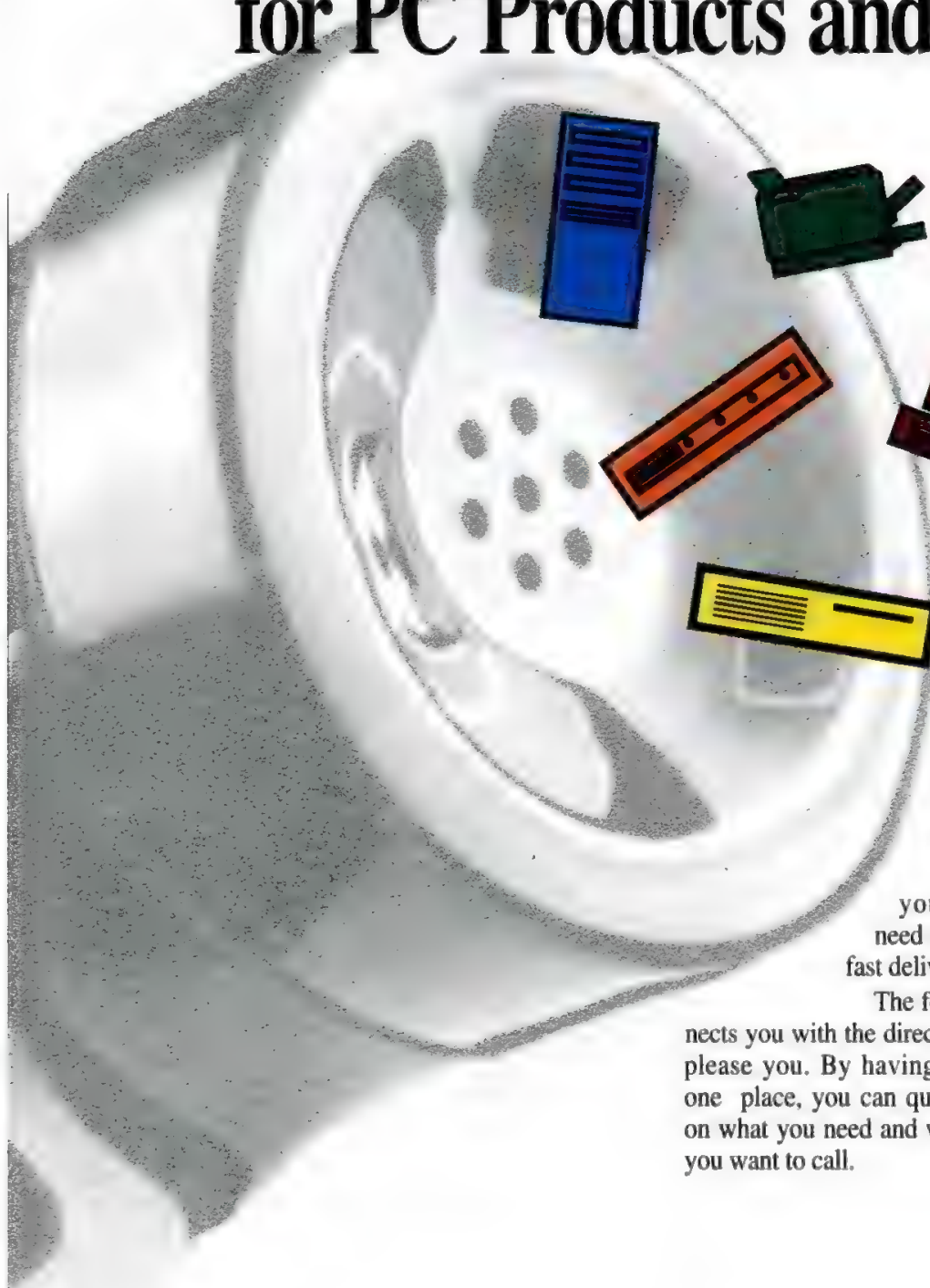
In past years, I've been asked how to get *NetWare* batch files to recognize birthdays or special occasions and do all sorts of specialized tasks. BATCHMAN lets your batch files handle such jobs easily, not only in *NetWare*, but in other types of networks as well.

Both KEY-FAKE.COM and BATCHMAN are available on PC MagNet along with the rest of the *PC Magazine* utilities. See the PC MagNet News page (immediately following the Utilities column) for downloading information.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tip we print. Please submit your letter on a disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's box named PC MAGAZINE LAN LABS). We are unable to answer letters individually. ■

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VGA 1024	\$1,499	\$1,569	\$1,699	\$1,769

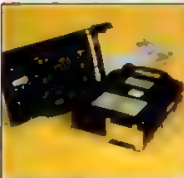
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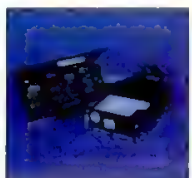
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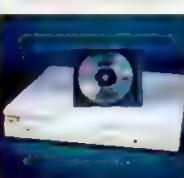
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WD 16 bit IDE Host - with dual floppy controller	39
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WDAC280 80mb IDE 28ms	339
WE1007V-SE2 ESDI AT 1:1 dual controller	149



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Lantastic 2mbps Starter Kit - Two Station	369
Lantastic 2mbps Adaptor	169
Lantastic Ethernet Starter Kit - Two Station	499
Lantastic Ethernet Adaptor	239



ATI VGA Wonder+ \$189

New and improved, the ATI VGA WUNDER+ is faster than VRAM. It does interlaced and non-interlaced 1024x768 modes, is 100% register compatible, and comes with extensive software drivers. A free mouse is included as an added bonus. 512K version \$219

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2400 ETC Internal	Call
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9600/E External MNP V.42bis	479
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VGA Wonder + 512K	229
Brown Wagh Sound Blaster	149

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RAM3000 16 bit RAM card	75
RAM8000 16 bit RAM card	169

Hayes	
JT FAX 4800B Internal	139
Personal Modem 2400 w/Prodigy	119
Hercules Graphic Card +	169

Intel	
Classic 2400 Modem Int/Ext.	137/167
Satisfaction Classic - Internal 9600	379
8087-2	115
287XL	199
387-DX2	479
387-SX16/20	319/349

Logitech	
ScanMan Plus	165
ScanMan 256	289

Orchid	
ProDesigner II 512/1mb	279/329
Tiny Turbo 288	207
Tiny Turbo Xtra	267



This external modem features V.42 and MNP error correction combined with MNP/5 and V.42 bis data compression to provide total high speed throughput. The PM9600ISA is also V.12 TCM, V.32, V.22 compliant and comes with a five year guarantee.

Paradise	
Basic VGA - 8 bit	109
VGA 1024 256K/512K	175/199

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PM9600ISA Ext. V.32/V.42bis	449

Prometheus	
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Promodem 2400G External	149

USRobotics	
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Courier HST 14,400 Dual Standard Ext.	859

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VGA 1024i 512K	209
V-RAM VGA 512K	299

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HC2400 Internal	79
2400 V.42bis External Modem	169
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- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
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VGA Color	\$1,099	\$1,169	\$1,209	\$1,369
VGA 1024	\$1,199	\$1,269	\$1,309	\$1,469

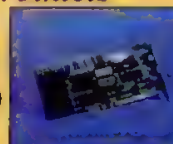
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Multisync 2a	469
Multisync GS 2a	199
Multisync 3d	629
Multisync 4d	Call
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Princeton	
Seiko CM1440/1450	519/659
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FastData MGP Card	29

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P3300	369
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KXP4450/4455 Lasers	Call
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XB2410 / 2415	429 / 569
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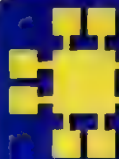
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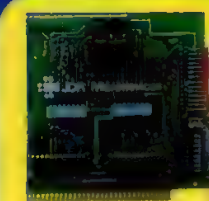
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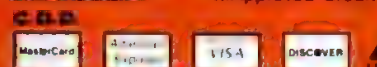
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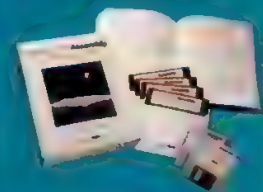
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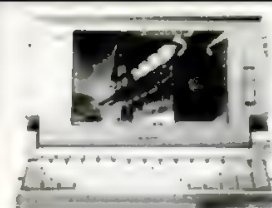
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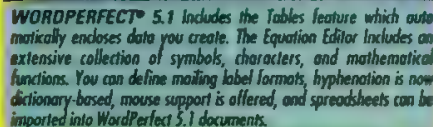


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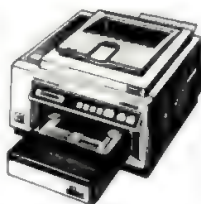


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■ IDEA GENERATORS AND BRAINSTORMERS

You may be under the impression that packages like *Brainstormer*, *IdeaFisher*, and *The Idea Generator Plus* will think for you. No such luck! They do, however, help inspire and organize creative thinking by forcing you to examine problems, issues, and ideas from every angle.

■ HIGH-PERFORMANCE 20-MHz 386SX PCs

With abundant disk capacity, plenty of RAM, and a processor RAM cache for extra speed, these ten 20-MHz 386SXs can do the job of full-fledged 386DXs. Read about the latest PCs from AGI, AST, CompuAdd, Computer Market Place, Diamond Technologies, Eltech, Leading Edge, Micro Express, Polywell, and Zenith.

■ COMMUNICATIONS SOFTWARE

Plenty of users buy PIMs, grammar checkers, and DOS shells, but not enough to give these programs the must-have status of software categories like word processors, spreadsheets, databases, and, of course, communications packages: Anyone with a modem simply *must* own one. Here we review over 15 character- and Windows-based communications packages with Zmodem protocol support and more.

■ LASER PRINTER BOOKS AND TAPES

Virtually a fixture in computerized offices, laser printers can be a mystery to users. These books and tapes are full of tips that can solve common printer problems. Contributing editor Bruce Brown tackles a variety from general reference to technical guides for programmers. ■

PC MAGAZINE MARKETPLACE INDEX

P

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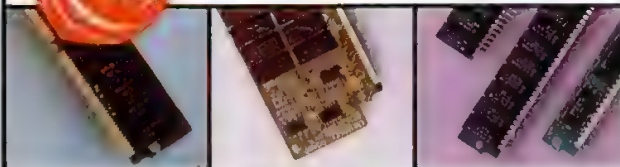
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CD-ROM				Business Project Management			437	Mailing Programs		431	438	Business Opportunities			
Communications	410			Business Time Management	413		437	Manufacturing		431	438	Consultants			
Computer Systems	411	422		CAD/CAM	413			Medical			438	Data Conversion		435	440
Connectivity				Communications	414	429		Multisusers				Data Recovery Services		435	
Disk Drives	411			Computer Languages			437	Music	416	431	438	Disk Conversion		436	
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Rentals			437	Education			437	Security		432					
Security				Engineering		430	437	Statistics	420		439				
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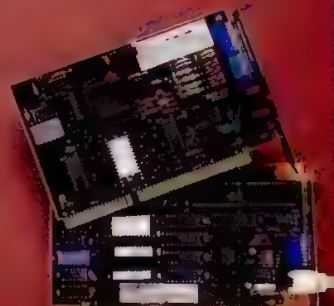
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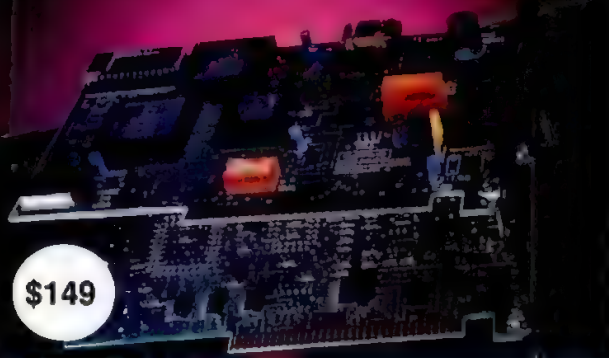


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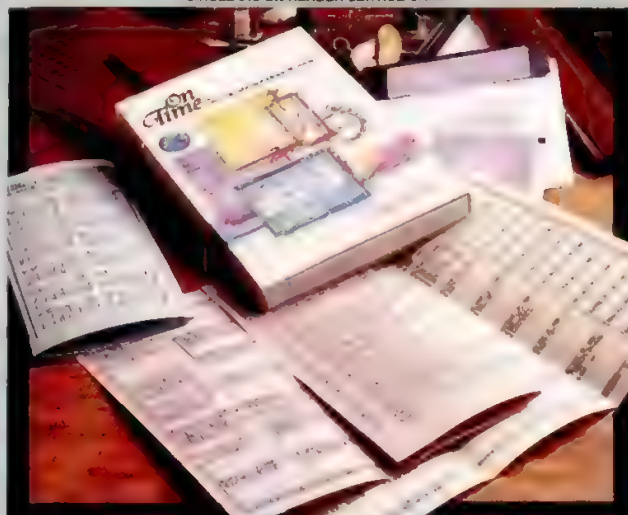
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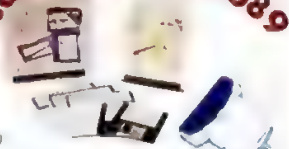
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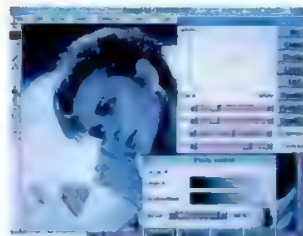


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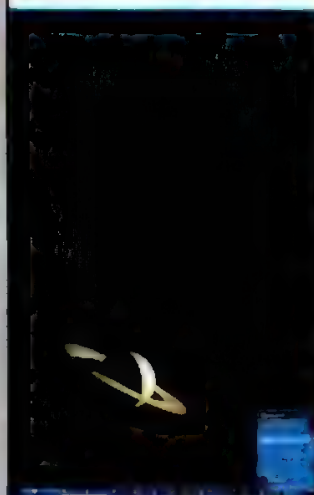
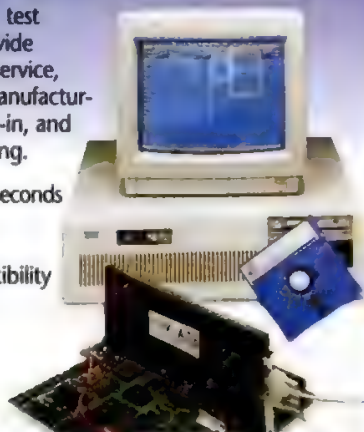
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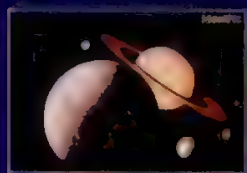
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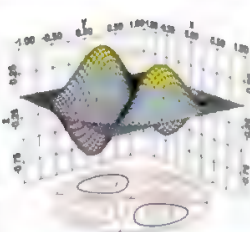
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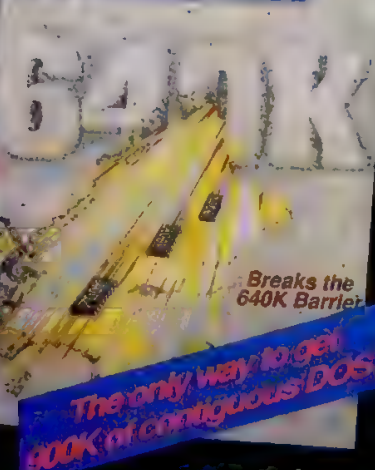
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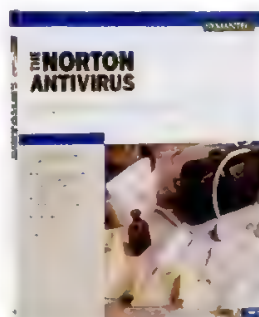
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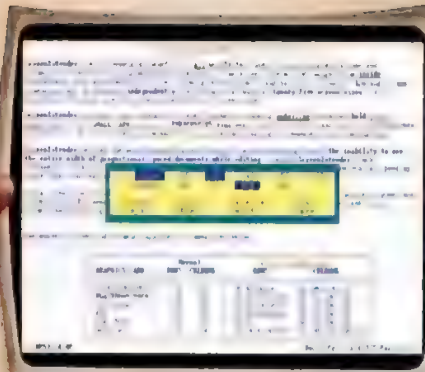
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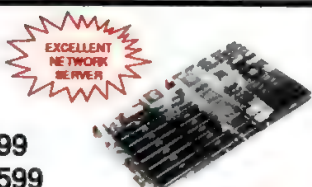
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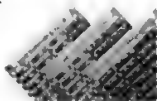
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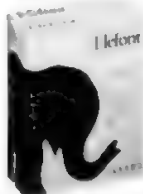
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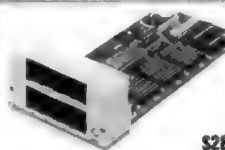
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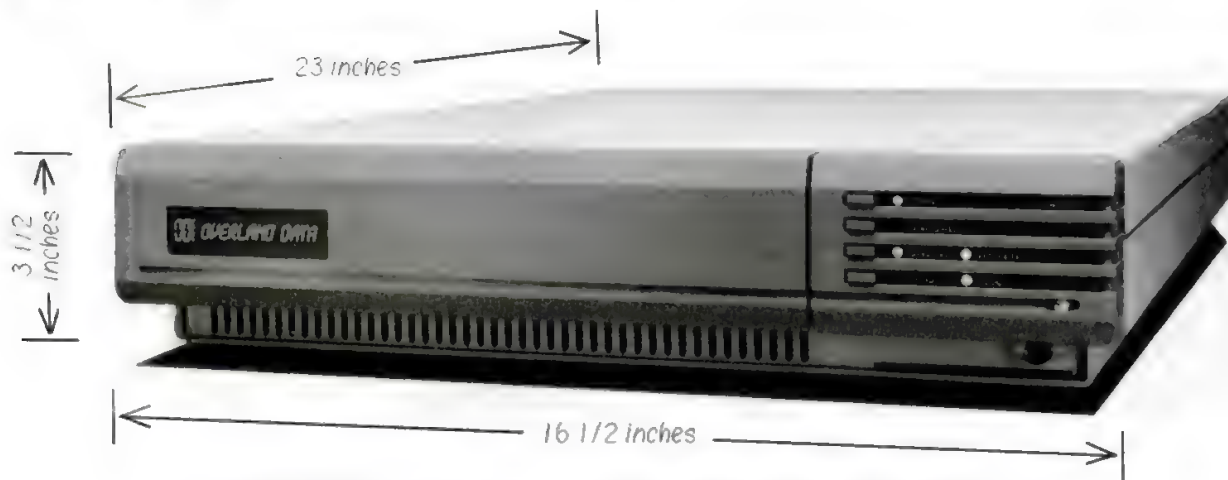
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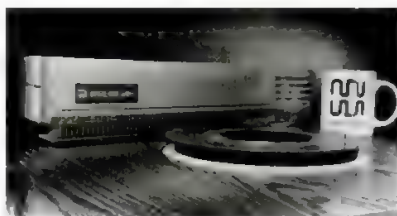


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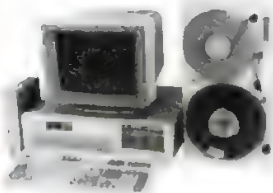
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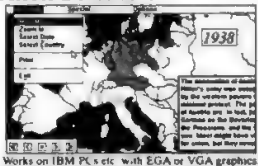
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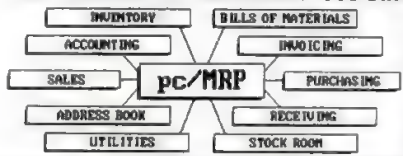
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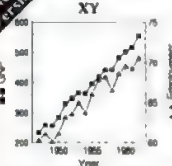
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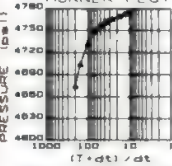


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• Durable extruded aluminum case

• Reads all major bar code types

• 30-day money-back guarantee

EZBarcode PC-WEDGE II

• Free bar code printing utility included
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RS-232 version \$319
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Portable Hand held Data Collection Terminals

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Print Code 39, UPC, EAN, 2 of 5 on dot matrix or Laser Jet printers

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On average, PC Magazine's direct market purchasers have spent—

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order

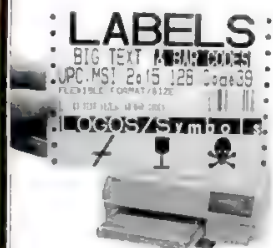
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Source: Beta Research Study, 1988
*BPA Audit June, 1990

BAR CODING

BAR CODE HEADQUARTERS

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BAR CODING

*continues on
the next page.*

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83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

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Source: Beta Research Study, 1988
*BPA Audit June, 1990

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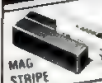
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- Over \$52 million in applications software
- Over \$52 million in computer systems
- Over \$22 million in supplies
- Over \$12 million in systems
- Over \$61 million in peripherals
- Over \$500,000 in consulting services
- Over \$8.9 million in other computer products and services

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:

1 issue—\$600, 3 issues—\$550, 6 issues—\$510, 12 issues—\$480, 17 issues—\$460, 22 issues—\$450. Multiple-ad per issue rates also available. Prepayment must accompany each insertion. VISA/MC welcomed.

AD FORMAT:

PC Magazine will design and typeset each BusinessCard ad. Advertisers should furnish type-written copy. Ads include: 1) Headline (one line, initial caps=30 characters maximum, all caps=25 characters maximum), 2) Descriptive copy (5 lines, 225 characters maximum), 3) Company name (same specifications as headline), and 4) Address and telephone number (two lines, 40 characters per line). Sorry, no logos, artwork or camera-ready ads.

DEADLINES:

PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date. Please send copy and payment to: PC Magazine BusinessCard, One Park Avenue, 3rd Floor, New York, NY 10016, ATT'N: Vickie Pinsky. For more information, call Vickie Pinsky at 800-825-4237 or 212-503-5120, FAX: 212-503-5860.

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After Hours

Products for the Leisure Side of Personal Computing

Deluxe Scrabble Combines Game Board, Dictionary, And Computer Opponent

GAMES
by Don Trivette

Keeping score has always been the least enjoyable chore for Scrabble players, since point values vary depending on where a word is placed and how it interacts with adjacent words. The word "Scrabble" itself is worth 42 points if it covers a red triple-word square or 28 points if it covers a pink double-word square. *The Deluxe Computer Edition of Scrabble* from Virgin Mastertronic computes word scores automatically, and that's just one of the slick features in this new computer version of the classic board game.

In case you are not one of the 33 million people who have played Scrabble, here's how it's done. Each player blindly draws seven tiles from which he, she, or it (a computer player) must make a word that reads from left

to right or top to bottom on the board. In addition, the word must join another word already on the board. Certain squares on the board double or triple letter values and other squares double or triple the word score.

In the Mastertronic's version, from two to four can compete in any combination of human and computer players. The computer performs at a variety of skill levels ranging from dumb as dirt to savvy as a scholar. One of my favorite approaches is to set one computer player against another with a 30-second time limit and watch the words fly. When I'm feeling keen, I compete with the computer at level 9—and win. The secret of my success is to manipulate the timer to allow the computer only 10 seconds to play, while giving me all the time I need. If this doesn't seem sportsmanlike, I can only say that a player (computer or not)

who uses words like "aa" doesn't deserve any quarter.

One of *Scrabble*'s best features is the built-in Official Scrabble Player's Dictionary, which automatically tests each word as it's played; you can use the user dictionary to add words like "zit" that haven't made the official dictionary. And if you've got a spare 2.5MB on your hard disk, you can install dictionary definitions and thereby learn that "aa" is a noun meaning rough, cindery lava.

Although *Scrabble* can be played with keyboard or joystick, it's a natural for a mouse, and the programmers did an excellent job with the interface. You can pick up tiles and try them in different places just as you would when playing the board game. Another really thoughtful feature is the ability to dynamically change many of the parameters while a game is underway. In addition to changing the timer, you can allow or disallow two-letter words and new words formed by adding an "s." You can substitute human and computer players while a game is in progress, and there's



even a take-back feature if your conscience gets the better of you for using "zit."

I can't find much wrong with *Deluxe Scrabble* except a hard disk installation procedure that installs programs and files for four different monitors (CGA, EGA, VGA, and Tandy) and then leaves it up to you to delete the ones not needed. The VGA graphics are sparkling; rarely if ever has a game board translated to the PC screen so beautifully and functionally. The mouse interface is a joy, there are lots of ingenious and convenient features, and, best of all, you'll never have to compute the score. Anyone who loves words will love playing the new *Deluxe Scrabble*.

List Price: *Deluxe Scrabble*, \$59.99.

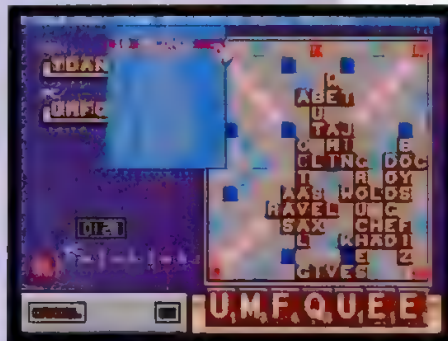
Requires: 640K RAM, graphics monitor; hard disk and mouse recommended. Virgin Mastertronic, 18001 Cowan, #A, Irvine, CA 92714; 714-833 8710.

CIRCLE 611 ON READER SERVICE CARD

CONTINUES



Deluxe Scrabble has a built-in dictionary that ends arguments about whether a particular high-scoring word actually exists.



You can change many of *Deluxe Scrabble*'s configuration options during play, such as time allowed per move.

Treasure Mountain! Raises Learning to New Heights of Fun

EDUCATION
by Charles Taft

Have you heard of *Treasure Mountain*, where the magic crown in the castle protects all who dwell on the mountain? Well, now the Master of Mischief has stolen the magic crown, and he's using its powers against the inhabitants. The elves of *Treasure Mountain* are asking you, a Super Solver, to reclaim the crown and restore peace. That's the premise of *Treasure Mountain!*, the latest in the Learning Co.'s popular Super Solvers series of educational games. You control the animated Super Solver character, which will be instantly familiar to players of earlier games in the series.

Your assignment is to uncover all of the mountain's hidden treasures: jewelry, lamps, cakes, and toys, just to name a few. They're located behind bushes, under trees...wherever. After you've discovered the treasures, you bring them to the castle on the mountaintop and place them in the treasure chest. When you've accumulated 300 treasures, the Master of Mischief

must give up the magic crown.

The elves will help you. They'll give you magic coins (which can make hidden treasures appear), supply you with a net to catch other elves, and give you a backpack to hold the treasures until you reach the castle. The elves can also show you a map that reveals the location of major landmarks and the entrance to the castle. (Trainee Super Solvers receive additional help from Flutter the Butterfly, who guides them through the initial plays of the game with on-screen hints.)

As a Super Solver, you must develop your own strategies for collecting clues and finding treasures. You must figure out, for instance, that while all elves give gold coins, only a few carry scrolls. These scrolls contain puzzles (quiz questions); correct answers lead the you to hidden treasures.

As you move up the ranks from Trainee Super Solver to Champion, the game gets more challenging. Elves who were formerly friendly may throw elf dust at you. If it touches you, you lose a gold coin. Bridges that



The Super Solver returns treasures to the chest in the castle, much to the dismay of the Master of Mischief.

you safely walked across earlier suddenly collapse. You must jump over them or fall part way down the mountain. Ladders in the castle that led you up to the Master of Mischief's lair end abruptly and trap you on the castle wall. The Master of Mischief may create a window in the castle wall at any time, reach through, and knock you off the ladder. It takes quick reflexes to grab a ladder and break your fall...or to change ladders and avoid him completely.

Winning is rewarding! When you unlock the treasure chest and return the treasures, the Master of Mischief scowls, frowns, or blows smoke out of his ears to show his displeasure. When all 300 treasures are returned, he is forced to return the magic crown, and you become a Champion Super Solver.

Treasure Mountain! offers superb graphics and animation. The elves jump, dance, turn, and evade your net. The animated Super Solver character walks, somersaults, and climbs at your command. The scenery changes, and treasures are hidden in different locations each time you play the game. Over 350 questions test reading ability, spelling, math, and problem-solving skills. The instruction manual is clearly written, and gives Super Solvers (and their parents) good advice on locating treasures and winning back the crown. As you reach higher "star" levels, you can collect more treasures each time you play the game; this

enables you to explore the mountain more fully and regain the crown more quickly.

Even younger Super Solvers who are nonreaders can enjoy the game (with a little help from Mom or Dad). Our five-year-old son is just learning to read; when I read the puzzles to him, he was usually able to select the right answer and use the clues to locate treasures. (The program is recommended for children aged five to nine.)

Anything I'd change in *Treasure Mountain!*? The music could be more varied; the "exploration and treasure hunting" background music remains the same throughout the game, regardless of the Super Solver's "star" level. Although the sound didn't bother our son, the music's repetitiveness could grate on parents well before their child tires of the program.

Treasure Mountain! can be addictive, even for an adult player. (I found myself playing it far more than necessary to write a review.) But not to worry. It's good clean fun.

List Price: *Treasure Mountain!*, \$49.95. **Requires:** 512K for IBM PC and compatibles (640K for the Tandy 1000); DOS 2.0 or later; color graphics. 8-MHz or faster processor recommended. Supports Ad Lib or Sound Blaster sound cards. The Learning Co., 6493 Kaiser Dr., Fremont, CA 94555; 800-852-2255.

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Super Solvers who catch a scroll-carrying elf earn a magic coin and the chance to answer a "puzzler," or quiz question.

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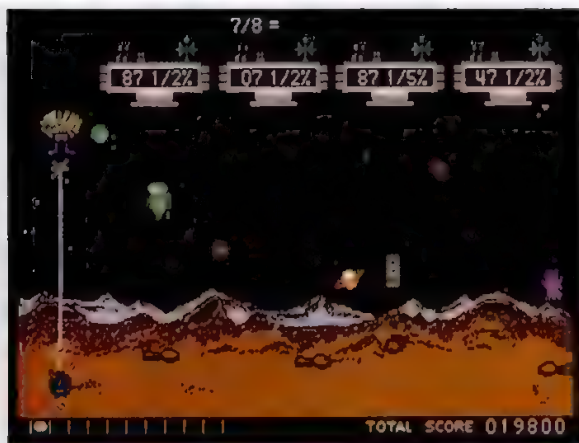
New Math Blaster Adds Arcade Challenge to Drills In Basic Mathematics

EDUCATION
by Charles Taft

Math problems have to be boring, right? Wrong! *New Math Blaster Plus*, from Davidson & Associates, incorporates drills and exercises into four arcade games that keep kids so involved,

by "zapping" flying debris.

The fourth game, Rocket Launcher, doesn't have an environmental theme (unless, of course, the rocket is using alternative fuels). Players answer math problems and, after each series of questions, construct a part of the rocket. When the



New Math Blaster Plus folds math drills into a suite of colorful arcade games that teach painlessly.

they're probably not aware they're doing m-a-t-h. Players sign on, meet the Blasternaut and his robot friend Spot, and then select a game: Rocket Launcher, Trash Zapper, Number Recycler, or Math Blaster.

Three of these games use ecological themes. Math Blaster players try to guide the Blasternaut to his space station with correct answers (while avoiding flying garbage) before "trash aliens" land on the planet. Number Recycler players help the Blasternaut make valid equations by moving columns of numbers and symbols in the recycling chamber. (These numbers are "recycled" for use in future problems.) Trash Zapper players enter the missing value in an equation; after five correct answers, the player helps the Blasternaut clean up space

rocket is complete, the Blasternaut lifts off into space.

Throughout each game, players are given plenty of feedback. Correct answers are rewarded with sounds or nods from the Blasternaut. If a player makes an incorrect choice, the correct one blinks or the Blasternaut shakes his head negatively. Players can retake the questions they missed at the end of each session.

The Blasternaut is a cute, nonthreatening little bugger; he looks like a green version of the Pillsbury dough boy wearing a space suit. (Our five-year-old son has adopted him and calls him "Blasty.") Since *New Math Blaster Plus*'s interface utilizes the directional arrow keys and the spacebar, even little hands have no trouble playing the games.

The Davidson Student Desk-

top Interface helps both children and parents navigate through the program's selection and editing choices. You can select from the program's "prepackaged" exercises (including 750 math facts) and choose any of six levels of difficulty. The exercises range from beginning math to fractions, decimals, and percentages. Recommended player ages are 6 to 12.

Parents and older players can use the editor feature with the Rocket Launcher, Trash Zapper, and Math Blaster games. It allows creation of exercises to "stretch" the program for children younger or older than the recommended ages. You can also use the editor to prepare exercises that teach a particular topic. Our five-year-old son is learning (very) basic math, and I used the editor to create a simple ten-question drill for him using the 1's progression (i.e., $1 + 1 = ?$, $2 + 1 = ?$, etc.). By using the standard questions as a diagnostic quiz, a friend determined that her seven-year-old was having difficulty with problems that added, subtracted, or multiplied numbers and zeros (e.g., $13 \times 0 = ?$). She used the editor to develop a drill that used *only* number and zero equations.

The instruction manual is well written and usually quite clear. A word to the wise: Take the time to read the manual before letting your children play the game. Subdirectories and

record-keeping functions must be set in advance to prevent loss of scores. (The Davidson customer support staff can walk you through the setup if you'd like.)

One of the nicest things about *New Math Blaster Plus* is that Davidson continues to improve the software in thoughtful ways. I've always disliked games that come with high-score game cards already filled in. The players names are unknown, and the scores are usually unobtainable without a post-graduate degree in gaming. Davidson has recently revised *New Math Blaster Plus* (beginning with the 10/31/90 MATH.EXE file disk) to include a blank scorecard. You sign on, and y-o-u-r score is recorded.

New Math Blaster Plus has nice audio. We've recently installed a Sound Blaster and were pleasantly surprised at how much the sound card enhances the game's appeal. (Even without additional sound hardware, the game has good sounds.)

Young kids loving math exercises? You bet your blaster!

List Price: *New Math Blaster Plus*, \$49.95. (Upgrades from earlier versions, \$19.95.)

Requires: 512K RAM for IBM and compatibles (640K for Tandy); DOS 2.1 or later; graphics adapter. Supports Ad Lib and Sound Blaster sound cards. Davidson & Associates Inc., P.O. Box 2961, Torrance, CA 90509; 800-545-7677.

CIRCLE 613 ON READER SERVICE CARD

My Paint: Well-Chosen Tools for Artistically Inclined Youngsters

EDUCATION
by Robin Rankin

Kids (budding artists that they are) and paint programs are a natural fit. Until now parents had to choose between two extremes if they wanted to provide their young Picassos with electronic art supplies. They could either burden their children with serious adult-size programs such as *PC Paintbrush* or bore them with weak, unsatisfying color-in-the-pictures software.

My Paint—a \$49.95 paint

program tailored for kids—bridges the gap. It offers a well-chosen subset of an adult paint program, and adds the whimsy of brightly colored, animated menus. It not only allows kids to draw freestyle with adult-like paint tools, but also lets them fill in predrawn coloring book type pictures—a healthy form of electronic meditation.

My Paint greets children with an invitingly animated toolbox. The OOPs (undo) icon is a head that gently nods "no-ingly"

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After Hours

My Paint

CONTINUED

from side to side. The eraser icon is shown busily erasing a flower; the brush icon—a hand—is hard at work painting a line. When a child chooses a color from the 12-color paint palette, a smiling face appears on the chosen color.

Then there's the glitz that children adore. Click on the color cycling icon and your on-screen drawing madly cycles through the bottom six colors in the color palette, creating a garish animated-looking effect. A special rainbow paintbrush spews a stream of rainbow colors as you paint. And although the paint tools are an abbreviated set of grown-up tools, I found only one serious omission. Kids are disappointed that there is no font tool to help them annotate their work.

If the blank slate of the traditional paint program interface

gets boring, children can investigate the entire additional package housed behind the coloring book icon. They can choose from among 28 predrawn outline drawings (additional books, with over 25 drawings each, are available for \$19.95) to color by filling in the areas.

When it comes to saving or printing a file and exiting *My Paint*, the icon metaphor quickly breaks down; parents will need to come to the rescue. Holding down the Alt key and clicking on the coloring book icon, for example, brings up a series of conventional text-based menus for printing a drawing. And needless to say, kids will be mildly disappointed when their lovely color pictures are reduced to poorly mapped black-and-white images at the printer, unless you happen to have an Epson JX-80 or compatible for color output.

My Paint could benefit from the addition of fonts, simple graphics primitives (such as circles and rectangles), pattern fills, and effects such as spray



My Paint offers a thoughtfully chosen subset of the functions found in "adult" paint programs.

paint. The color palette is limited, too. Still, *My Paint* is considerably more engaging than any other kinder-paint programs I've seen. It delivers a near-perfect set of capabilities for tenderfoot computer graphics mavens. If you have kids—especially if they are between ages three and eight—you'll want to make

My Paint your paint. ■

List Price: *My Paint*, \$49.95.

Requires: 512K RAM, EGA or VGA monitor, DOS 2.11 or later, mouse or joystick (mouse highly recommended). Saddleback Graphics, 3621 W. MacArthur Blvd., #119, Santa Ana, CA 92704; 714-540-4062.

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by
Bill Howard

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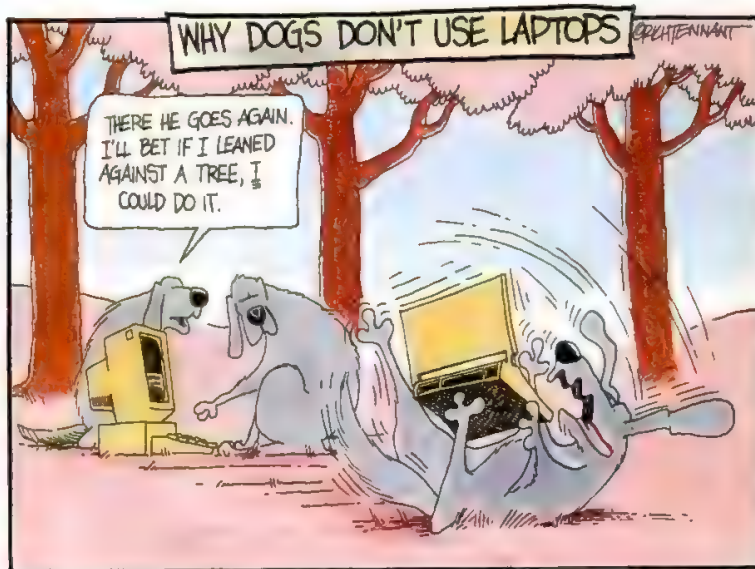
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UNIX Today, November 26, 1990

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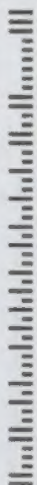


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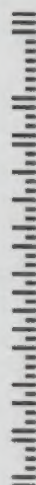


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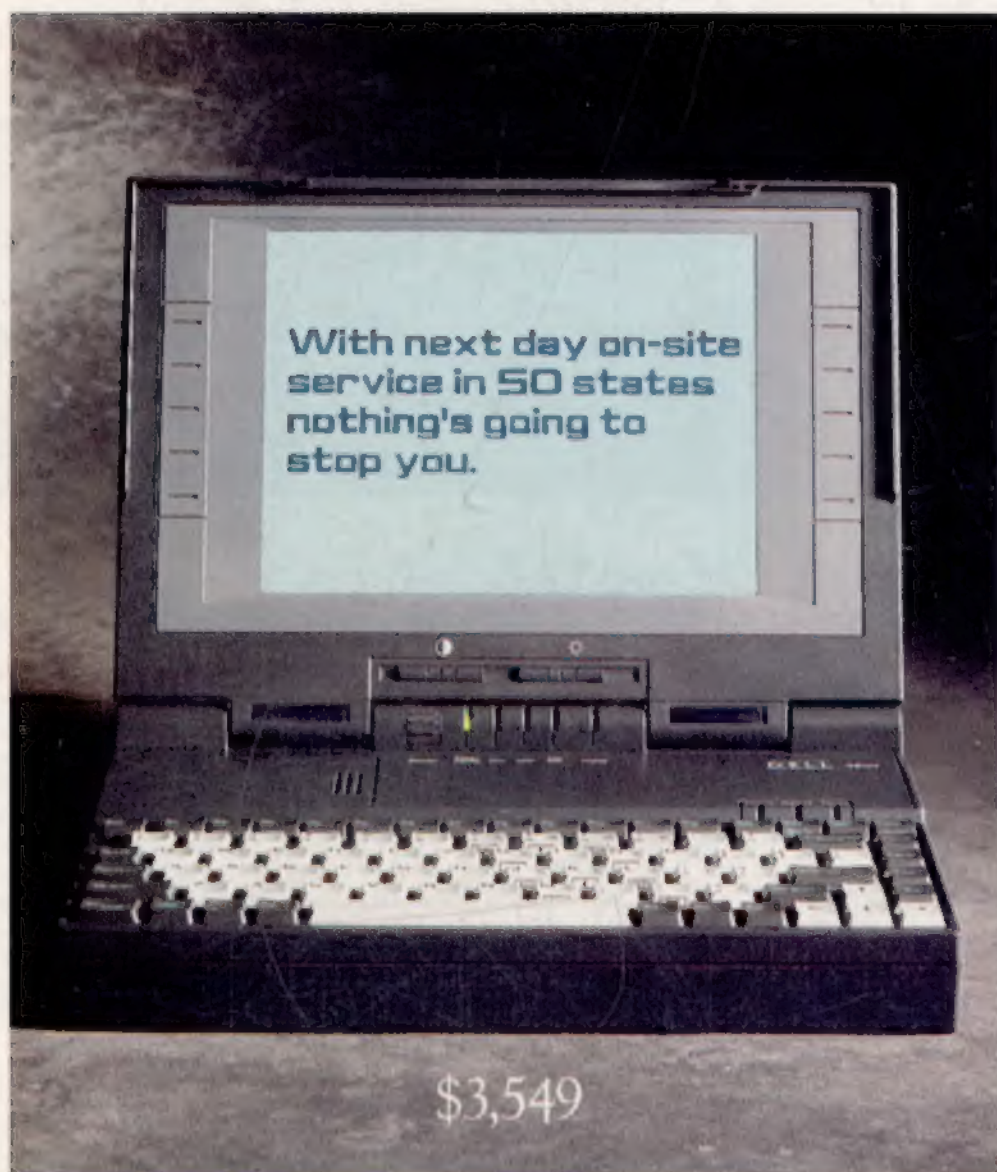
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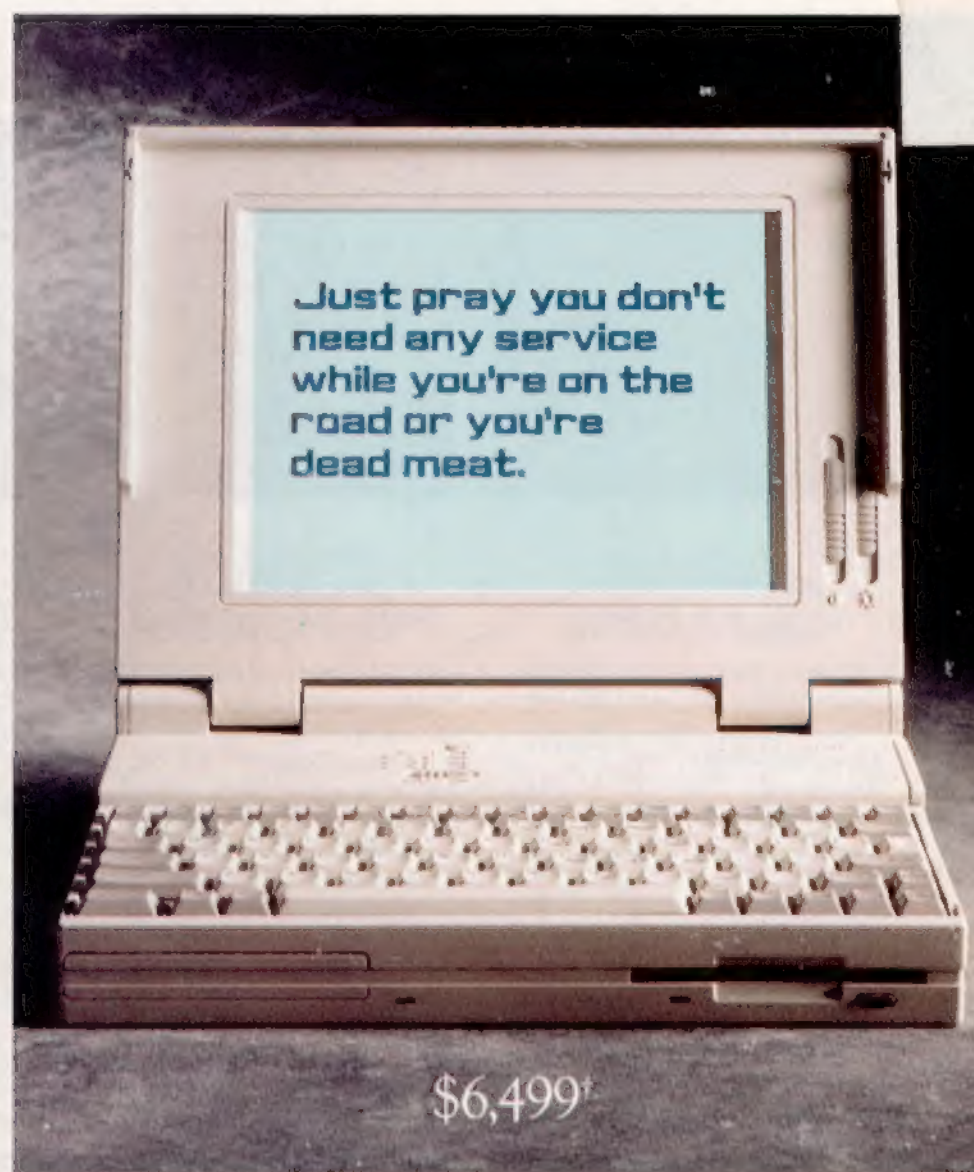
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